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Analysis of Principles Involved in Task Work with Bonus

By Walter N. Polakov
Consulting Engineer

THE following analysis undertakes to trace the logical coherence of some managerial principles following necessarily from a given set of postulates. No attempt is here made to outline the technique of their application, chiefly because it cannot be alike in any two individual cases, and partly because the technique in each individual case would reveal itself to an experienced person from the principles outlined and circumstances encountered.

An industrial system based on the maxim:

A—"from each according to his ability—
"to each according to his service."

is necessarily profoundly different from the system based on any other set of postulates, such as

B—"from each fulfillment of his duties—
"to each a uniform reward."

The first set of postulates (A) determines the following dual responsibility of the management:

"To see that the abilities of each are fully utilized, and to see that the reward of each is commensurate with the results."

The second set of postulates (B) places upon the management a vastly different set of responsibilities:

"To see that none falls below the minimum demanded, and to see that none is rewarded above the accepted norm."

The system based on the first set of postulates is therefore positive, creative, stimulating. The system based on the second set of assumptions is, on the contrary, negative, conservative, restraining, limiting.

The first tends to place the industry on a higher level by liberating all mental and physical abilities and rewarding the striving for perfection.

The second tends to keep the industry on the level attained in the past and offers no inducement for improvement.

By detecting one or another set of postulates in a given system of industrial management it is possible to trace one or another group of operating doctrines:

The first set involves:
1—determination of individual ability
2—development of it by instructions and training
3—incentive for striving for perfection
4—rewarding according to attainment

While the second set operates through:
a—general assignment of duties
b—supervision of their performance
c—disciplinary measures for failures
d—payment of accepted wages

The main principles underlying the operations of the first group form the subject-matter of the following paragraphs:

Individual Ability

It is assumed that to find out what one likes best to do and then to exercise his ability doing it is the prerequisite of:
1—individual satisfaction
2—common benefit

Selection of a workman for a given job is to be guided by two considerations, equally important:
a—is the individual capable of doing the job?
b—does the individual like to do it?

To determine whether the individual is capable of doing the job well, it is necessary first to *analyze the job* itself and to ascertain:
What physical capacities are essential
What aptitudes require further development
What mental faculties are required

The applicant should then be examined from:
The bio-mechanical point of view
The psychological point of view

By comparison of required qualifications and available characteristics it may be decided whether the applicant:

1—is fit for the job as is
2—can be fitted for the job by training
3—is unfit and cannot be fitted

or else, in the latter case (3) it is possible to fit the job to the applicant either by:

4—selecting suitable occupation for him
5—adjusting the job to fit individual propensities

When a fit man is thus selected for a job, or a fit job is selected for a man, it is important to inquire whether the job has an adequate appeal for the man.

An individual of higher qualifications than the job requires may be accepted, but will soon lose interest.

For an unemployed any job has a certain appeal; the question is, will the interest be sustained?

Therefore, even well placed men should be frequently re-examined in order to find out whether:

1—Actual labor process does not undermine health
2—Interest wanes

Appropriate readjustments could then be made before any harm is done or dissatisfaction is aroused.

When all this is done with even the highest degree of care it still remains to consider that a man is not only what he is, but also what he thinks himself to be.

Fancied grievances are as real as physical facts. Personal idiosyncrasies, social prejudices, religious notions, political sympathies, etc., deserve consideration quite as much as do physical defects like intemperance, poor sight, fits, etc.

No record of examination of an applicant is fully dependable.

Bio-mechanical, physical, and physiological data, even if registered by instruments, may prove to be untrustworthy because of:

a—exceptional conditions of applicant during his examination
b—physical deficiency can be compensated by psychic efforts or mental development

Psychological findings are even more subject to inaccuracies in examination records because of:

c—exceptional state of mind during examination
d—personal inter-relations between the examiner and the examined

If a man likes his job, it is important that he *continue* to like it. Such continued satisfaction with one's work:

1—facilitates training and instruction
2—improves quality of work
3—maintains high output or even increases it
4—reduces turnover with its attending wastes

To maintain satisfaction in one's work a continuous interest in the work must be kept up.

II

Instructions and Training

"All men by nature desire to know," said Aristotle (Vol. VIII, 980a); this is no less true now and here than in ancient Greece.

Unless a man understands (knows) the process involved in his work he cannot be interested in doing it.

If a man is not interested in his work, he can only be trained to do it.

Circus and domestic animals, however highly trained in performing tricks, require constant supervision and direction from their trainers.

Direction is a substitute for initiative. Initiative comes from an understanding of a situation and from desire for certain results.

Instruction provides some understanding of relations between conditions and results.

If a man likes his work he is generally interested in instructions pertaining thereto.

A thorough instruction aids in developing intelligent initiative and therefore reduces the necessity for continuous personal direction.

Training provides working habits and dexterity.

While habit of a certain motion or set of motions or mental operations is being developed under training, the explanation should be given as to their purpose, consequences and advantages.

Training and instruction must be simultaneous.

Instructions in a correct practice must be supplemented by demonstration of faulty methods and wrong practices.

Errors in reasoning or in motions should be not only warned against but actually demonstrated by performance. "What can be shown, cannot be said."

Records must be kept of correct and wrong practices.

A record is a picture of reality. Reality passes but record remains.

Understanding of relations among recorded facts and past successes and failures is essential to avoiding failures in the future.

Interpretation of records of performance is the backbone of instruction and a guide in training.

Elements are analyzed from the whole; detailed instructions and elemental training *follow,* not precede, the envisaging of the whole process and defining the desired goal.

Clearly understood purpose is the guide for intelligent efforts.

Practice is of no avail unless it forms a habit.

The form in which experience contributes to knowledge is a recorded Standard Practice or Instruction Card.

An instruction card must be written clearly or not at all.

Organized, analyzed and recorded experience constitutes knowledge.

As Polus said, "experience made art, but inexperience—luck."

The management which is unwilling to trust luck, must record experience.

Good luck one day and bad luck another may give fair average, but proves bad management.

"With an efficient management there is but little difficulty in training the workmen to be efficient." (H. L. Gantt).

Instruction and training for performance are distinct from supervision and direction of production. One is sowing, the other, reaping.

The functions of an instructor are *not* those of an executive. No executive should undertake instruction and training.

An instructor *teaches how* to attain the desired results.

An executive *provides what* is necessary for attaining the desired results.

An instructor teaches how to overcome obstacles. An executive removes obstacles and prevents their re-occurrence.

Inspection of methods is a different function from inspection of results.

Inspection of methods employed and of progress in acquiring habits is the work of an instructor.

Inspection of results is the work of an executive.

An executive is apt to favor physical plant betterments and automatic equipment rather than careful development of methods and fixing the habits of industry.

Impatience is not a quality of a teacher.

Investment in improved equipment is a waste without improved methods for its use.

Efficient production means more than efficient equipment attended with well trained personnel.

Machines must be kept busy; men must be provided with right material when needed, in quantities required; orders must flow as scheduled for promised deliveries, without interruption; the plant must be maintained operative, safe and hygienic. Management must see to it that these things are done before task work with bonus is installed.

Without efficiency in higher places, no amount of efficiency in the workmen will avail very much. (H. L. Gantt).

(To be concluded)

The Dardelet Screw Thread

THE problem of designing a bolt from which the nut will not rattle loose, has been brought toward solution by the Dardelet screw thread, now becoming popular in France and Belgium. A bolt having the Dardelet thread might easily be mistaken, on casual inspection, for an ordinary machine bolt with an Acme thread. Closer examination would show that the lands of the thread are narrower than the grooves, thus leaving longitudinal play which would allow the nut to slip back and forth a little, if the thread were cut with the angles equal on each side.

By having the angles different on the two sides of the thread, and reversing these angles in the nut, there is a wedging action that tends to distort the thread as the nut is screwed on. In this way the elasticity of the material in both bolt and nut is used to hold the thread surfaces in contact and prevent slippage and consequent backing off of the nut.

The Bureau of Standards is carrying on a research to determine whether the Dardelet thread will be suited to American practice and to arrive at the best design. Experiments are being made to find out whether the binding angle should be formed on one side of the thread or on both sides. The proper angle of the binding surface is also to be determined.

French testimonials show that the Dardelet thread has been successful even under such severe conditions as in stamping machines and pneumatic riveters. Therefore it seems likely that it can be used for many purposes where cotter pins and castellated nuts are now employed.

SEEN · AND · HEARD

By John R. Godfrey

The OX airplane engine Users get the profits Lubrication

ONCE in awhile the unexpected happens. The old Curtis OX-5 airplane engine was thought by many to be obsolete, and the war surplus was sold at almost junk prices. The engines were then so cheap that little attention was paid to real overhauls, and they were frequently scrapped instead of being repaired. Everyone expected that a new and better small engine would appear before the "OX's" were used up. But, while there have been, and are, some very good small engines now available, the old OX-5 is still in demand. More attention is being paid to careful overhauls than was formerly the case. One order for 20,000 replacement pistons gives some idea of the extent to which users of these engines are nursing them along. New attachments for increasing the power are also being exploited, and the tenacity with which the old engine still hangs on, reminds one of the fabled nine lives of the back-fence cat.

* * * *

A recent article in a bankers magazine says, "the future of the aircraft manufacturing industry is less certain than that of air transport." In other words the outlook for the builders of the machines is not so good as for those who will profit by their use. This is so like the situation in the machine building game that it has a familiar sound, although the facts are seldom stated so boldly as in this case. It isn't easy to see just why the user of a machine should profit most by its use or be more secure as to future business. But that is the way it usually works out. I wonder if the machine builders may not be partly to blame for letting the other fellow get most of the gravy?

* * * *

Lubrication of machinery is an ever present problem. Ever since the squirt-can days, and some designers haven't yet left them very far behind, we have seen many attempts to secure positive and regular lubrication. Splash feeds, force feeds, spray pressure, grease cups, and all sorts of devices have been and are being tried. All of which is a good sign in view of the general belief that most of the idle time of our machines can be traced to lack of, or insufficient lubrication.

Getting oil or grease to the bearings frequently enough is not as easy as it sounds. Even with convenient lubricating appliances it requires more time than the man on piece work wants to take away from his work. So he lets it go until he gets to a good stopping place—which is frequently too late.

Lubricating devices cost real money but many large concerns believe it is economy to install them. As with any other investment, however, the first cost and the cost of operation must be balanced against the savings that can be effected, not in lubricant, as some try to show, nearly as much as in the continued operation of the machines. Idle machines are an expense.

Paying for Special Designs

FRANK Brown of the Brown Machine Works, and James French, machine builder on his own, were at loggerheads. French threatened to sue Brown, and altogether it was a mess where nobody but the lawyers seemed likely to profit. A mutual friend suggested that they might talk it over with Bill Holland—and here they are. Brown has the first inning.

"It's this way, Mr. Holland. We needed a special machine, and French and several others submitted plans and estimates. French was 'way high, and so we gave the job to Black and Beekman, over in Freeport. Now French threatens to sue because he didn't get the contract."

"That sounds fine, Brown," said French, sarcastically. "And while it isn't exactly false it is only part of the truth. You forgot to say that you gave Black and Beekman the contract to build *my* machine. I'd have had no kick coming if you had ordered their machine. But to send them my design and ask them to bid on it sort of gets under my skin."

"But it wasn't a patented machine, Mr. Holland. French had no claim on it. He submitted it, with a price that was too high, and so we asked another firm for bids. Black took it at a much lower price. Anything illegal about that?"

"Don't ask me to settle any legal questions, Mr. Brown," said Holland. "That's a job for a lawyer. But there's something more than law involved in this, and it affects the whole machine industry. Some call it by the name of ethics, or other more or less hifalutin designations. It seems to me it is just a case of plain, common decency between men.

"I don't know how such a case would stack up in a court of law. There may not be any legal reason to prevent Brown from peddling French's design to other builders and asking for bids. It's been done in too many cases, and nobody ever went to jail for it so far as I know. But it's a bad state of affairs, and I don't believe that Brown wants to be unfair when he comes to think it all over."

"But why couldn't French build it as cheaply as Black and Beekman, Mr. Holland? I'd rather have given him the job. But my directors won't stand for my paying more than I have to for machines."

"It's easy to see why Black and Beekman would take the order at a low price, Brown," broke in French. "They saw that their design had been turned down, and the only way to get the job was to underbid me. They hadn't spent any money designing this machine, and their own engineering time was lost anyhow. So they bid low. But the point is, you had no moral right to ask them to build my machine without paying me for the design, or at least getting my consent.

"If you had asked me to build a machine designed by someone else, I'd have supposed you had arranged with them for it. If I had any doubt in the matter I'd have asked them. As it is, I figure that you owe me not only a fair price for the design but an apology as well."

"How about it, Mr. Holland?" asked Brown. "Am I such a highway robber as French tries to make out? And how can we settle the thing without any lawyers butting in on it?"

"I don't fancy the idea of playing judge and jury at all. But this sort of thing happens too often to keep peace in the machine game. I can't blame French for being peeved. I guess you would, too, Brown. It's bad practice for all hands. I recall one case like this where it was settled by paying the designer a flat rate for the use of his design. In another his recompense was based on a fair profit on the building of the machine. In both cases it was recognized that he had a moral claim on the design."

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Discussion

Profits for Builder and User

The P. A. should confine himself to the profits accruing to his own company through the purchase of Jackson's tool. Instead of that, he

wastes his company's time and Jackson's time, in discussing the superficialities of the case, such as Jackson's profit which is none of his affair. This P. A. should realize that the whole is greater than any of its parts. He would then see that stockholders are more interested in the profits accruing to the whole enterprise through the purchase of a high production machine, than they are in a fictitious saving of $466.44 made by a P. A. who quibbles over the percentage of profit made by Mr. Jackson. Jackson has translated his skill, experience and integrity into a special machine. To evaluate this machine, the P. A. must either find another Jackson, or build the machine himself.

If this P. A. knows when a price is too high, he must also know when a price is too low, and when a price is just right. Such a P. A. must consider himself not only his brother manufacturers's keeper, but his guardian as well. Very likely he is one of those P. A.'s who "break down" a manufacturer's price by estimating the cost of each kind of material and labor, and then tell the manufacturer that a machine costs too much per pound. Perhaps this P. A. could have answered Prof. Bonn's recent query at Williamstown, as to why Americans consider themselves a nation with a message, and why so many Americans are professional or amateur uplifters always busy telling the other fellow what to eat and drink, how to manage his family, and how to run his business, instead of keeping quiet and sawing wood in their own backyards. —GEO. R. WOODS.

Assuming the manufacturer concludes that the machine, bought at the price quoted, will bring him a return sufficient to justify the investment, it is no concern of his whether the transaction represents a large profit or a distinct loss to the maker of the machine. Many articles are sold at prices far above the present cost of production, because years of research and development were spent in developing and preparing them for the market. The buyers of such articles are paying the manufacturers now for the effort which was without recompense during the period of development.

Some articles, too, are sold for less than the cost of manufacture because of overproduction, competition, or some other unfortunate circumstance. Imagine the buyer of such an article offering to pay a higher price to offset the loss sustained by the maker! Why, then, should the buyer of a machine ask "How much profit does the manufacturer get?" He should ask instead, "What is it worth to me?"

—JOHN H. HITCHCOCK.

Unfortunately, there are more shops where the chief concern is about making any profit at all, than about the amount of profit that it is justifiable for them to take. Most of my experience has been with the former, but part of my life has been spent in contact with firms that have, from time to time, been accused of making too much profit. Both shops, however, made staple products, priced according to the market. Their large profits were due to low cost production and ease of sale because of the high quality of the product; both the result of good, sane, common-sense management.

If they had reduced their prices, as they could, the result would have been an increased amount of business, probably a very similar total profit, but their competitors would have been forced out of business, because they could not have reduced their costs enough to stay in. They were not large enough. Is it not better for the country as a whole that there should be competition in all lines of manufacture, than that some one concern by virtue of size, control of raw materials, transportation, or any other advantageous circumstance, should become a monopoly?

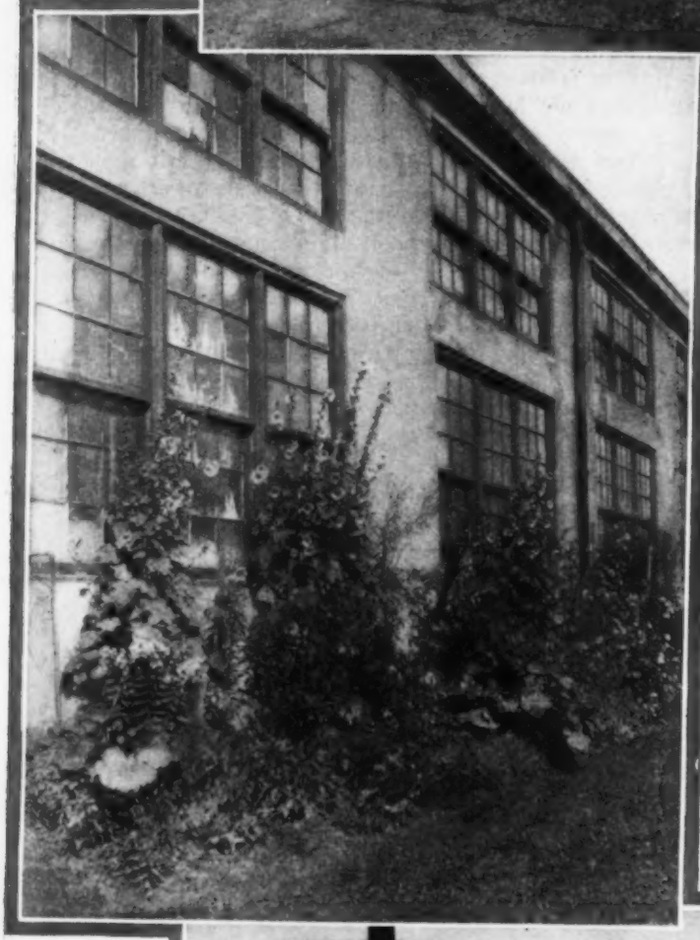
Neither of these concerns, and I imagine the same applies to most others in similar circumstances, reached their present position without a great deal of hard work that did not appear to be paid for at the time. They have earned their present profits, as they sacrificed a great deal to make them possible. —ENTROPY.

The Man Over Fifty

On our railroad we apparently have no difficulty with our old employees, for in nearly every instance, our old men are filling jobs fully as well as our younger men. We try to fit the job to the man. For instance, we have a locomotive inspector seventy-three years old. He is very active, very particular, and I doubt if it would be possible to get a better man at any age. In the shops, we have them doing the small assembly jobs, repairing jacks and other tools, and operating drill presses and light lathes.

If the older men in the shop are to be demoted to sweepers and watchmen, what encouragement is there for loyalty? It would seem to me that a shop would have a very poor reputation if it showed such consideration for its old employees. Good men would give it a wide berth. We pension our men at seventy if they want it, or at sixty-five if they are physically unable to work. Many of them do not want a pension at seventy, but prefer to continue on the job. This refers only to the shops. Retirement is compulsory for train crews.

Henry Ford finds that in some instances cripples, and even totally blind men, are more productive on certain jobs than those possessing all their faculties. He states that he owes his share to society. Do not other concerns owe fully as much? —P. W. LAMSON.



Brightening-Up the Railroad-Shop Grounds

THE accompanying illustrations show how successfully the management of the shops of the Canadian National Railways at Moncton, N. B., has succeeded in adding color to what is usually unattractive surroundings, and has turned cinders and blank walls into lawns and gardens. One man who was a gardener in the old country practically takes care of all of the grass and flowers, and in the winter works in one of the shops.

The illustrations were taken at different points in the plant, the mass of foliage at the right of the lower illustration being around the smokestack of the power house. Most surprising of all is the pit of the transfer table, which, instead of being a mass of cinders as usual, is an attractive lawn, containing nine spots of color in the shape of flower beds. The effect must be seen to be fully appreciated

The Design of Hobs for Taper-Threaded Joints

By Earle Buckingham

Associate Professor of Engineering Standards and Measurements
Massachusetts Institute of Technology

The analysis of the forms produced by hobbing both members of the joint with a tapered hob having straight-sided teeth applies also to any hobbed thread

THE average toolmaker or mechanic employed in machine tool, automobile, or other similar plants, if he ever gives any thought to the matter at all, usually considers the machine work involved in the making of oil-well drilling equipment as relatively crude. This may be true as regards much of the equipment used above ground, yet there are some details of this drilling equipment that would tax a good gage-maker to the limit to make satisfactorily. One particular example is shown in Fig. 1 illustrating a taper-threaded tool joint.

At first glance, the making of such a taper-threaded joint does not seem particularly difficult. We will first consider, however, the duty that such a joint must perform. This joint is used to attach a rotary drilling tool to the string of pipe that is connected to the drilling rig above ground. Similar joints are used between every three or four lengths of pipe in the string. For example, if the hole has reached a depth of four or five thousand feet and the derrick can handle about 100-ft. lengths, one of these joints will be used about every hundred feet, which will mean about forty or fifty of these joints. When the drilling tool must be replaced for any reason, the pipe is disconnected from the drilling rig and the whole string is hoisted up by the derrick until the first joint is above ground. A vise arrangement is provided on the floor of the derrick to hold the rest of the string while the first length of pipe is unscrewed and set up to one side in the derrick. Then the remainder of the string is hoisted up until the second joint is above ground, and this section is taken off as before. This process is repeated until the whole string is above ground. Thus these joints must be assembled and disassembled many times—and not always under very favorable circumstances.

The weight of the whole string of pipe is carried by the top joint in the string when the string is put in or taken from the hole. A string of pipe a mile long is no inconsiderable weight. When the actual drilling is being

The first part of the article. The conclusion will appear in an early issue.

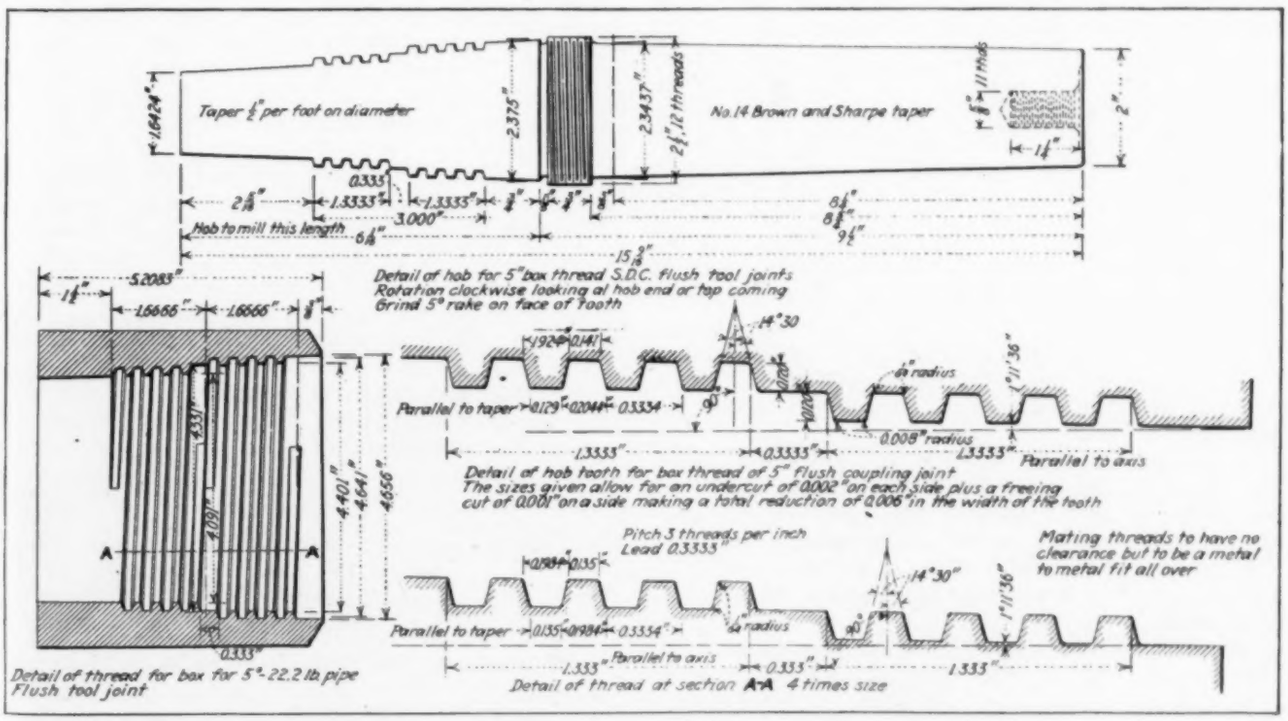

Taper ½" per foot on diameter
No. 14 Brown and Sharpe taper
Hob to mill this length
Detail of hob for 5" box thread S.D.C. flush tool joints
Rotation clockwise looking at hob end or top coming
Grind 5° rake on face of tooth
Detail of hob tooth for box thread of 5" flush coupling joint
The sizes given allow for an undercut of 0.002" on each side plus a freeing
cut of 0.001" on a side making a total reduction of 0.006" in the width of the tooth
Pitch 3 threads per inch
Lead 0.3333"
Mating threads to have no
clearance but to be a metal
to metal fit all over
Detail of thread for box for 5"-22.2 lb. pipe
Flush tool joint
Detail of thread at section A-A 4 times size

Fig. 1—Typical taper-threaded tool joint such as is used to attach a rotary oil-well drilling tool to the string of pipe connected to the drilling rig above ground

done, the torque required to turn the string of pipe and the drilling tool must be carried through these threaded joints. This tends to lock them very tightly. The joint must be so made that the taper threads will not freeze to each other, else it would be impossible to disassemble them without scoring and spoiling the joints. At the same time each thread must carry its proportionate share of the load, else some threads would be stressed beyond their elastic limit and a progressive failure of these threads might take place which would leave the drilling tool loose at the bottom of a hole possibly 8 in. in diameter and a mile or more deep. This would entail an expensive fishing job to recover the lost parts before anything further could be done. If the fishing is not successful—and such failures do occur—it would mean the entire loss of the hole. Thus these joints, to be satisfactory, must have as near a perfect fit as it is possible to obtain on crests, roots, and flanks of the threads as well as on the shoulder. About the greatest tolerance that is available is the amount represented by the deformation of the material under a load within its elastic limit. In addition to this exacting requirement of physical size and form, the surfaces must be as smooth as it is possible to make them in order to prevent seizing. Furthermore the material is heat-treated to the limit of machineability in order to obtain the greatest possible physical strength, as the loads and stresses to which these joints are subjected are so great that the factor of safety is often but little more than unity.

With this brief explanation of the service that these joints must render, it should be apparent that their production is not as simple and easy a task as might appear at first glance. In fact, a skilled joint-turner will produce work that would excite the envy of a skilled gagemaker.

It should be of interest to consider in detail some of the problems involved in the production of these joints. Heretofore most of the threads on these joints have been chased in a lathe. At the present time, however, some are produced by milling and considerable attention is being given to the possibilities of hobbing them.

Mathematically, there is but one method that will reproduce exactly the specifications of form given in Fig. 1, and this method is by chasing in a lathe with the cutting edge of the straight-sided threading tool so set that it always remains in a plane that contains the axis of the thread. This would mean a flat-topped tool set square and on the line of centers of the lathe. If rake is introduced on the top of this threading tool, or if the tool is set to the helix angle of the thread, there will be a difference in the form of the threads as the diameters change along the taper. Also such tools and settings will result in a slightly curved thread profile. With low helix angles, these variations will be very slight; in fact, so small that they may not be detected, yet mathematically they are present.

Either milling or hobbing will also produce a curved thread profile whose form will change along the taper, and it is not possible to make any form on such tools that will adhere strictly to the specifications on the drawing. Furthermore, with milling or hobbing, a fillet of greater or less extent will be developed at the roots of the threads.

There is, however, no superior virtue in the uniform, straight-sided thread profile specified on the drawing The essential requirement is that the form of mating threads match each other. Therefore if a better surface can be produced on the lathe with a chasing tool with top rake set at the helix angle, and the tool and setting are alike for both internal and external threads, mathematically the form of mating threads will be identical, even though this thread form may depart very slightly from a straight line and this form itself change slightly as the diameter changes. There would be a greater chance of producing satisfactory tool joints using a straight-sided tool under these conditions and taking the form that results than there would be in trying to doctor the shape of the tool to produce a closer approximation to the straight-line form, merely to conform to the thread form shown on the drawing.

The same is true also with milling and hobbing. We will therefore investigate the mathematical forms that would be produced on these joints by hobbing both

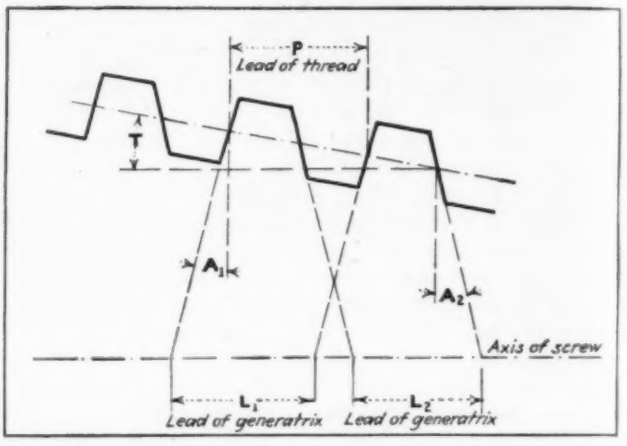


Fig. 2 — Analysis of the axial section of a hobbed taper thread, showing the variation of the lead of the generatrix along the axis

members with a tapered hob with straight-sided teeth. The following analysis applies also to any hobbed thread, straight or tapered.

The study of screw surfaces, or helicoids, is a very fascinating one and often introduces us unexpectedly to many old and familiar friends. Thus the surface of a hobbed screw thread is an involute helicoid, or exactly the same surface, mathematically, as that of a helical involute gear.

The equation of the curve formed by the intersection of such a surface with a plane that contains its axis is as follows: This is ordinarily called the axial section.

$$x = \frac{L}{2\pi}\left[\frac{\sqrt{y^2 - a^2}}{a} - \arctan\frac{\sqrt{y^2 - a^2}}{a}\right] \qquad (1)$$

Where L = lead of generatrix along the axis
a = radius of base cylinder
y = any radius of helicoid
x = corresponding distance along the axis of the helicoid.

And
$$a = \frac{L}{2\pi \tan A} \qquad (2)$$

where A = angle of generatrix with plane perpendicular to the axis. (The angle of the generatrix is the angle of the side of the hob tooth.)

The tangent to this curve is given by the following equation:

$$\tan A' = \frac{2ay}{L\sqrt{y^2 - a^2}} = \frac{y}{\tan A\sqrt{y^2 - a^2}} \qquad (3)$$

where A' = angle of tangent with the axis of helicoid.

On straight threads, the lead of the generatrix along the axis is the same as the lead of the thread, but on taper threads these leads are different, as an inspection of Fig. 2 will show.

It is apparent from this diagram that the lead of the generatrix of one side of the thread is longer than that of the thread while that of the other side is shorter. Thus when P = lead of thread

L_1 = longer lead of generatrix
L_2 = shorter lead of generatrix
A_1 = angle of longer lead
A_2 = angle of shorter lead
T = angle of taper on radius.

Then $L_1 = P(1 + \tan A_1 \tan T)$ (4)

$L_2 = P(1 - \tan A_1 \tan T)$ (5)

When a hob is used to produce a thread, there is a certain amount of side-cutting due to interference with the helices of the thread. It is this side-cutting action that results in the formation of the curved thread form on the work because the helix angle changes with the diameter and the greater the helix angle, the more the side-cutting. Regardless of the diameter of the hob, however, the form of this curved thread profile will be the same, but the larger the diameter of the hob, the greater the amount of this side-cutting and the higher the fillet at the root. In order to compensate for this side-cutting, the teeth of the hob must be made thinner. We

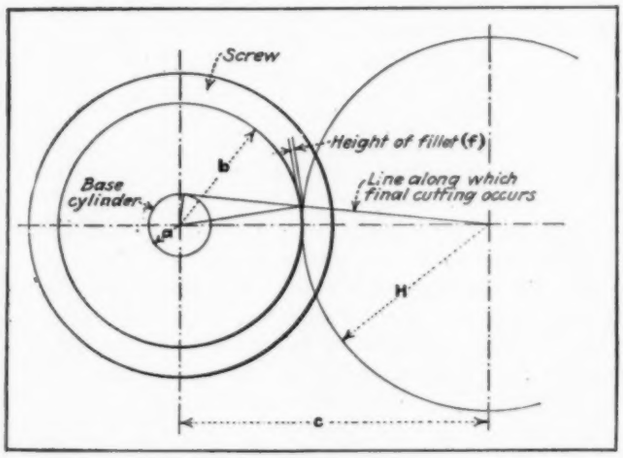


Fig. 3—Diagram of a hob cutting a taper screw, or the pin of a tool joint. The final cutting of the hob tooth takes place along a cone element tangent to the base cylinder of the hobbed thread

will now determine the amount of this side-cutting and the height of the fillet on both external and internal threads.

A diagram of a hob cutting a screw (or the pin of a tool joint) is shown in Fig. 3. The final cutting of the hob tooth takes place along a cone element that is tangent to the base cylinder of the hobbed thread. This line is established by drawing a line from the center of the hob to the circle representing the base cylinder. In this figure.

a = radius of base cylinder
r = radius to middle of thread form on pin
R = radius to middle of thread form on hob
C = distance between centers of hob and pin
H = outside radius of hob
b = root radius of pin
f = height of fillet at root of screw

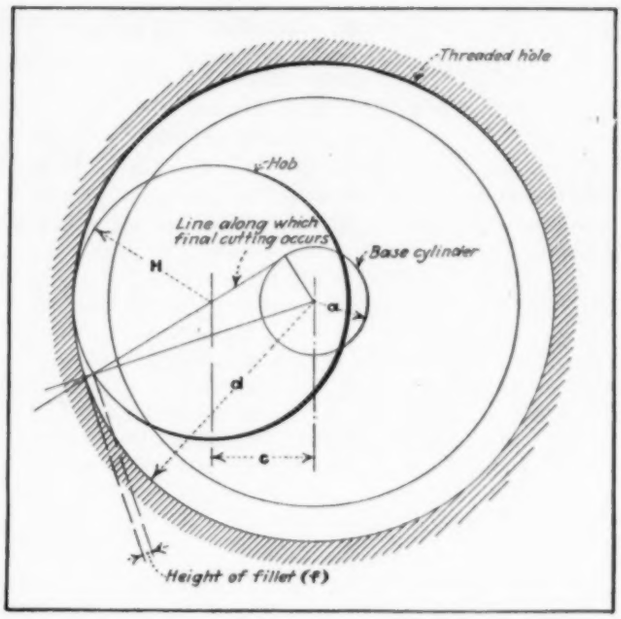


Fig. 4—Diagram of a hob cutting the thread in a hole, or, in the example cited in the text, the box of a tool joint

t = amount of side-cutting on one side at middle of thread form
A = angle of generatrix.

Then $t = 2 \tan A \left[\sqrt{C^2 - a^2} - \sqrt{r^2 - a^2} - R\right]$ (6)

$f = \sqrt{C^2 + H^2 - 2H\sqrt{C^2 - a^2}} - b$ (7)

A diagram of a hob cutting the thread in a hole (or the box of a tool joint) is shown in Fig. 4. In this figure the symbols are the same as in Fig. 3 except that

d = outside or root radius of thread in box

and $C = r - R$

Then $t = 2 \tan A \left[\sqrt{r^2 - a^2} - \sqrt{C^2 - a^2} - R\right]$ (8)

$f = d - \sqrt{H^2 + C^2 + 2H\sqrt{C^2 - a^2}}$ (9)

We now have all the basic equations required to determine the forms of the threads, the amount of side-cutting and the height of the fillet for any hobbed thread either straight or tapered. We will therefore determine these factors for the largest and smallest thread diameters on the pin and box shown in Fig. 1, using hobs of the diameters specified there. Starting at the large end of the pin we have the following values:

$P = \frac{1}{3}$ = lead of thread
$\tan T = 0.250/12 = 0.02083$
T = 1 deg. 11 min. 37 sec. = angle of taper on radius
A = 14 deg. 30 min. = angle of generatrix
$\tan A = 0.25862$.

Then from equation (4) we have

$L_1 = 0.33333(1 + 0.25862 \times 0.02083)$
$= 0.33513$ in. (longer lead)

$L_2 = 0.33333(1 - 0.25862 \times 0.02083)$
$= 0.33154$ in. (shorter lead)

We will now determine the form, side-cutting and height of fillet on the longer lead at the large end, or the side of the thread towards the large end. Thus:

Outside diameter of pin	4.646 in.
Depth of thread	0.120 in.
Outside diameter of hob (at small end)	3.350 in.

Whence $r = 2.263$ in.
$R = 1.615$ in.
$C = 3.878$ in.
$H = 1.675$ in.
$b = 2.203$ in.
$A = 14$ deg. 30 min.
$L = 0.33513$ in.
and from equation (2) $a = 0.20624$ in.

Solving equation (1) for the following values of **y**, we obtain

y in.	x in.
2.203	0.48845
2.223	0.49360
2.243	0.49875
2.263	0.50390
2.283	0.50905
2.303	0.51420
2.323	0.51936

The curve of this profile is so slight that we must go to the sixth decimal place to get any measure of it. In general, unless the helix angle is appreciable, it is not necessary to calculate the co-ordinates of the profile. In all cases where it is done, however, the values used should be carried to seven or eight decimal places in order to get any reliable determination. This requires the use of trigometric tables to the same number of places. The values in this analysis have all been calculated to eight decimal places.

Determination of Tangent

We will now determine the tangent to this profile at the middle of the thread by means of equation (3). For this we obtain

$$\tan A' = 3.88287266$$
$$A' = 75 \text{ deg. } 33 \text{ min. } 28 \text{ sec.}$$

The corresponding angle of the hob is 75 deg. 30 min., so that the resulting thread is 3 min. 28 sec. different from the angle on the hob.

We will now determine the form, side-cutting and fillet from equation (6). For this we have the following values:

$C = 3.878$ in.
$a = 0.20624$ in.
$R = 1.615$ in.
$r = 2.263$ in.
$\tan A = 0.25862$ in.
Whence $t = 0.00203$ in.

We will now determine the height of the fillet at the root of the thread from equation (7). For this we have the foregoing values and

$b = 2.203$ in.
$H = 1.675$ in.
Whence $f = 0.00417$ in.

We will now determine the form, side-cutting and fillet on the shorter lead of the large end of the pin, or the side of the thread towards the small end. For this we have the following values:

$r = 2.263$ in.
$R = 1.615$ in.
$C = 3.878$ in.
$b = 2.203$ in.
$A = 14$ deg. 30 min.
$L = 0.33154$ in.
and from equation (2) $a = 0.20403$ in.

Solving equation (1) for the following values of y, we obtain

y in.	x in.
2.203	0.48930
2.223	0.49445
2.243	0.49960
2.263	0.50475
2.283	0.50990
2.303	0.51505
2.323	0.52020

We will now determine the tangent to this profile at the middle of the thread by means of equation (3). For this we obtain

$$\tan A' = 3.88250706$$
$$A' = 75 \text{ deg. } 33 \text{ min } 23 \text{ sec.}$$

This shows that the angle of the thread is 3 min. 23 sec. different on this side of the thread from that on the hob and it is 3 sec. different from the angle on the opposite side of the thread.

We will now determine the amount of side-cutting from equation (6). For this we have the following values:

$C = 3.878$ in.
$a = 0.20403$ in.
$R = 1.615$ in.
$r = 2.263$ in.
Whence $t = 0.00199$ in.

We will now determine the height of the fillet at the root of the thread from equation (7). For this we have the foregoing values and

$b = 2.203$ in.
$H = 1.675$ in.
Whence $f = 0.00408$ in.

We will now determine the form, side-cutting and fillet on the longer lead at the small end of the pin. For this we have the following values:

Outside diameter of pin 4.264 in.
Depth of thread 0.120 in.
Outside diameter of hob (at large end) 3.732 in.

Whence $r = 2.072$ in.
$R = 1.806$ in.
$C = 3.878$ in.
$H = 1.866$ in.
$b = 2.012$ in.
$A = 14$ deg. 30 min.
$L = 0.33513$ in.
$a = 0.20624$ in.

Solving equation (1) for the following values of y, we obtain

y in.	x in.
2.012	0.43929
2.032	0.44444
2.052	0.44958
2.072	0.45473
2.092	0.45988
2.112	0.46502
2.132	0.47017

We will now determine the tangent to this profile at the middle of the thread by means of equation (3).

Whence $\tan A' = 3.88599438$
$A' = 75$ deg. 34 min. 8 sec.

The angle of this side of the hobbed thread is 4 min. 8 sec. different from that the hob.

We will now determine the amount of side-cutting

from equation (6). For this we have the following values:

$C = 3.878$ in.
$a = 0.20624$ in.
$R = 1.806$ in.
$r = 2.072$ in.

Whence $t = 0.00248$ in.

We will now determine the height of the fillet at the root of the thread from equation (7). For this we have the foregoing values and

$b = 2.012$ in.
$H = 1.866$ in.

Whence $f = 0.00508$ in.

We will now determine the form, side-cutting and fillet on the shorter lead, or the side of the thread towards the small end, at the small end. For this we have the following values:

$r = 2.072$ in.
$R = 1.806$ in.
$C = 3.878$ in.
$A = 14\frac{1}{2}$ deg.
$L = 0.33154$ in.
$a = 0.20403$ in.

Solving equation (1) for the following values of y, we obtain

y in.	x in.
2.012	0.44013
2.032	0.44528
2.052	0.45042
2.072	0.45557
2.092	0.46072
2.112	0.46587
2.132	0.47102

We will now determine the tangent to this profile at the middle of the thread by means of equation (3).

Whence $\tan A' = 3.88557973$

$A' = 75$ deg. 34 min. 3 sec.

The angle of this side of the hobbed thread at this diameter is 4 min. 3 sec. different from that of the hob.

We will now determine the amount of side-cutting at the middle of the thread from equation (6). For this we have the following values:

$C = 3.878$ in.
$a = 0.20403$ in.
$R = 1.806$ in.
$r = 2.072$ in.

Whence $t = 0.00243$ in.

We will now determine the height of the fillet at the root of the thread from equation (7). For this we have the foregoing values: and

$b = 2.012$ in.
$H = 1.866$ in.

Whence $f = 0.00498$ in.

We now have determined all of the necessary values for the thread on the pin. In the concluding part of the article, we will determine the corresponding values for the thread in the box. The influence of rake on the hob teeth will also be considered.

Another automobile builder has announced his intention of entering the airplane field. This addition to the regular line of manufacture involves the purchase of equipment different from that in present use, and adds to the total of machine sales.

Depreciation at Cost or Replacement Value?—*Discussion*

By L. L. Thwing

MR. WEIMAR, who recently propounded and discussed the above question, would be interested in reading the paper presented at the spring meeting of the A.S.M.E. by Mr. Du Brul, general manager of the National Machine Tool Builders' Association. This paper appeared in the May issue of *Mechanical Engineering*, and the resulting discussion was published in the August issue.

From a strictly theoretical basis it does seem unfair to the present generation to charge it with the presumably increased cost of replacing equipment at some future date. We pay for these improvements but do not get the benefit of them. However, this seems to be an unavoidable necessity for the firm that wishes to do its own financing. It is, moreover, a continuation of the practice of the earliest mechanics.

It seems impractical to discuss the fine points of the theory of depreciation, however interesting it may be as mental gymnastics. President Dow of the A.S.M.E. says "Depreciation and obsolescence should be capable of proof." The only time this can be done is after the facts are all in the hands of the accountant. By that time the old machine is on skids and the new one installed in its place. The actual result of our guesses as to how long a machine will wear, how soon it will become obsolete, and how much the device that replaces it will cost, are so far from the actual facts that any minor correction in method is lost in the large limits of error.

The practical method is to have enough in the reserve to make needed replacements. If there is too much, the balance is undivided profits; if it is too little, the difference must be borrowed. As this latter is what usually happens, the present generation does have to pay for the tools it is using and not those that it expects to use.

Draftsmen's Error Contest—*Discussion*

By S. Udo

IN AN article on the above subject in Vol. 69, page 534, of the *American Machinist*, the author has gone back to his school days in "keeping tabs" on the draftsman. Keeping count of the mistakes may have been all right in school, but out in the business world this does not work so well. The designer should be looked upon with some respect. When his mistakes are advertised in the drafting room, his pride is hurt so as to disgust him with his work.

Posting the mistakes made by the draftsman will form a basis of comparison among the fellow workers, and the fellow on top will not hesitate very long in demanding an increase. Such a competition would be unfair to the draftsman who works twice as fast and therefore affords twice as much chance for errors. It depends solely upon the chief draftsman to see that the errors are reduced to a minimum, and it is his duty to reprimand the draftsman who is persistent in making the errors. The average draftsman does not make errors intentionally, and if, after passing through the checkers, an error is found in the shop, it is only because "no errors are made where no work is done."

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Finding New Ideas on Shop Visits

"I HEAR the treasurer sort of balked at paying traveling expenses for some of the foremen Williams sent out to visit shops. Did you hear about it, Al?"

"Yes I did, Ed. He isn't sold on the idea at all. Thinks Williams and we foremen ought to know all that's worth knowing about shop work. Perhaps we had, but we know we don't—and never will."

"Does that mean we don't get out on any more trips, Al? I'll miss it if we don't. It does a fellow good to get out—gives him more of an interest in his job."

"Williams is sold on sending men out, and he won't give it up without a struggle. The trouble is none of us have kept much of a record of ideas we've brought back, so he hasn't any black and white evidence to show the man with the check book."

"It does cost a lot of money, Al. And I can see where they might balk. They can't afford to spend a lot of money on the chance that a man might bring back a good idea, can they?"

"Depends on the firm, Ed. Williams thinks it's a good investment. He may even send you out again. But he's got a plan that ought to make it easy for any foreman to pick up enough to pay for the trip."

"I'm listening, Al. Don't quite see how any plan will make a man see things in the shop."

"Williams has doped out a list of things to look for in the shops—such as how machines are arranged as to light and materials; different conveyor layouts; safety devices; types of storage racks; shop lighting; what types of machines are used on work similar to ours; sanitation; methods of wage payment such as piece rates, bonus or premiums; and a lot of other questions."

"Do you have to answer 'em all, Al?"

"Well, I guess it's a good idea to be able to jot down something about most of them, Ed. But the main idea is to get us foremen in the habit of looking for points we might be able to use. Another point is that it makes a fellow organize his ideas."

"I like to go out once in awhile, Al, but I'm not keen on answering a lot of questions about it afterwards. Doesn't sound so good to me."

Is Williams' idea good of giving foremen a list of things to look for? Or, does it tend to keep them from seeing other things? Is Ed right in objecting to answering a questionnaire?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Standards for Machine Finishes

THE system shown in Fig. 1 is in effect in one government engineering department. The only thing necessary for the draftsman to do is to make a check mark against the finish he desires for the majority of the finished surfaces shown on his drawing. Where any special finish is desired, he uses the proper symbol to

☐ Buff
☐ Hand Finish
☐ Smooth Machine Finish
☐ Rough Machine Finish
☐ Rough File or Grind
☐ Sand Blast
☐ Remove Fins and Sprues
☐ Finish All Surfaces not Otherwise Specified

Fig. 1—Standard finish symbols used by one engineering department

designate that finish at that particular point. This can be applied to filed, sandblasted, rough ground or any other kind of finish desired.

Naturally, these symbols can be made to suit conditions in any shop and would not necessarily be alike for all shops. Where a sandblast finish, or another rough finish is required on a casting, the pattern maker would have to be educated to read the finish marks so as not to allow extra metal for cutting. It is only a matter of calling his attention to this point once.

In the symbols shown, there is range enough to cover all desired information without having to clutter up the drawing with lengthy notes. I believe that one of the reasons the usual drawing does not specify the exact finish required is because the draftsman does not like to write out the necessary notes. —E. M. PIERCE.

Holding Back on Piecework

WHO is to blame for most of these conditions? Obviously, something is wrong with the time-study and rate-setting department. In a great many cases, a piecework rate is set in a haphazard way, using past time as listed in the cost record as a basis for time standards. This method may be O.K. for estimating selling prices, but is usually unsafe as a basis for piecework rates. A piecework rate should be set only after accurate time and motion studies have been made, and after a study of existing conditions, so as to obtain a correct standard time, including allowances for fatigue and tool grinding.

I believe that if piecework rates were based upon the results of scientific research, rather than upon guessing which is often miscalled "judging," practically all of the trouble Bill Saunders and hundreds of others like him have, would be nearly, if not totally, eliminated.

—JOHN R. GRAY, *Mgr., Time Study Dept.*

UNDER the present methods of time study, piecework prices are set very nearly where they should be, and the danger of a reduction is very slight. Under these conditions there is very little reason for holding back the slips. However, many a man likes to average about the same amount every week, and so frequently holds back in anticipation of a poor week. Yet the custom isn't as prevalent as it was. —P. H. PEARSON.

A Chance to Grow

I BELIEVE that the United States is not the only country offering equal chance for all, but that chance is offered under conditions that make success easier to attain in this country. The opportunities here are more numerous, and the advantages more easily obtained than in any other country.

Equal chance alone will not lead to success. It does, however, offer the individual a good opportunity to grow, both mentally and morally, so that he may build himself up and become a successful man. Those who succeed are the ones who take advantage of the equality of opportunity, and by steady continuous mental and moral growth, are able to reach the promised land of success.

—JOSEPH VIGGIANO.

Putting One Over on the Builder

THE machine tool business, and the whole profession of engineering, are remarkably free from deceit and fraud. The engineer is accustomed to dealing in facts, and his training is one that does not readily encourage any form of malpractice. The executive who would countenance the line of conduct subscribed to by Ed is not worthy of his position. Apart from the damage he will cause to the company's reputation, can such a man be trusted? Is he not the very one to bring a similar philosophy to bear on his own errors?

—C. NORMAN FLETCHER, *England.*

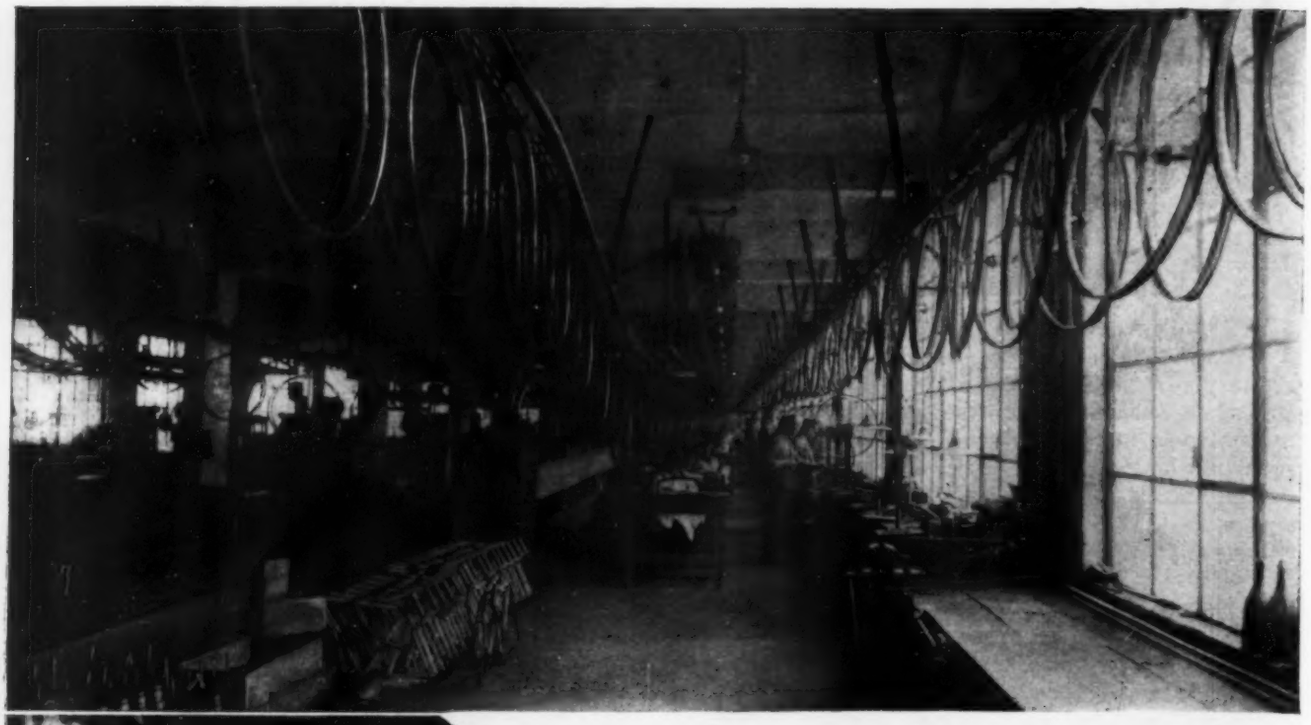
THE·NEXT·TOPIC

Getting Ideas from Other Shops

ADVANCE QUESTION

Al tells Ed about two ideas that one of the foremen brought back from an inspection trip. Al thinks the ideas alone pay for the trip. Ed is doubtful. How about it?

Conveyor Applications in a German Bicycle Plant



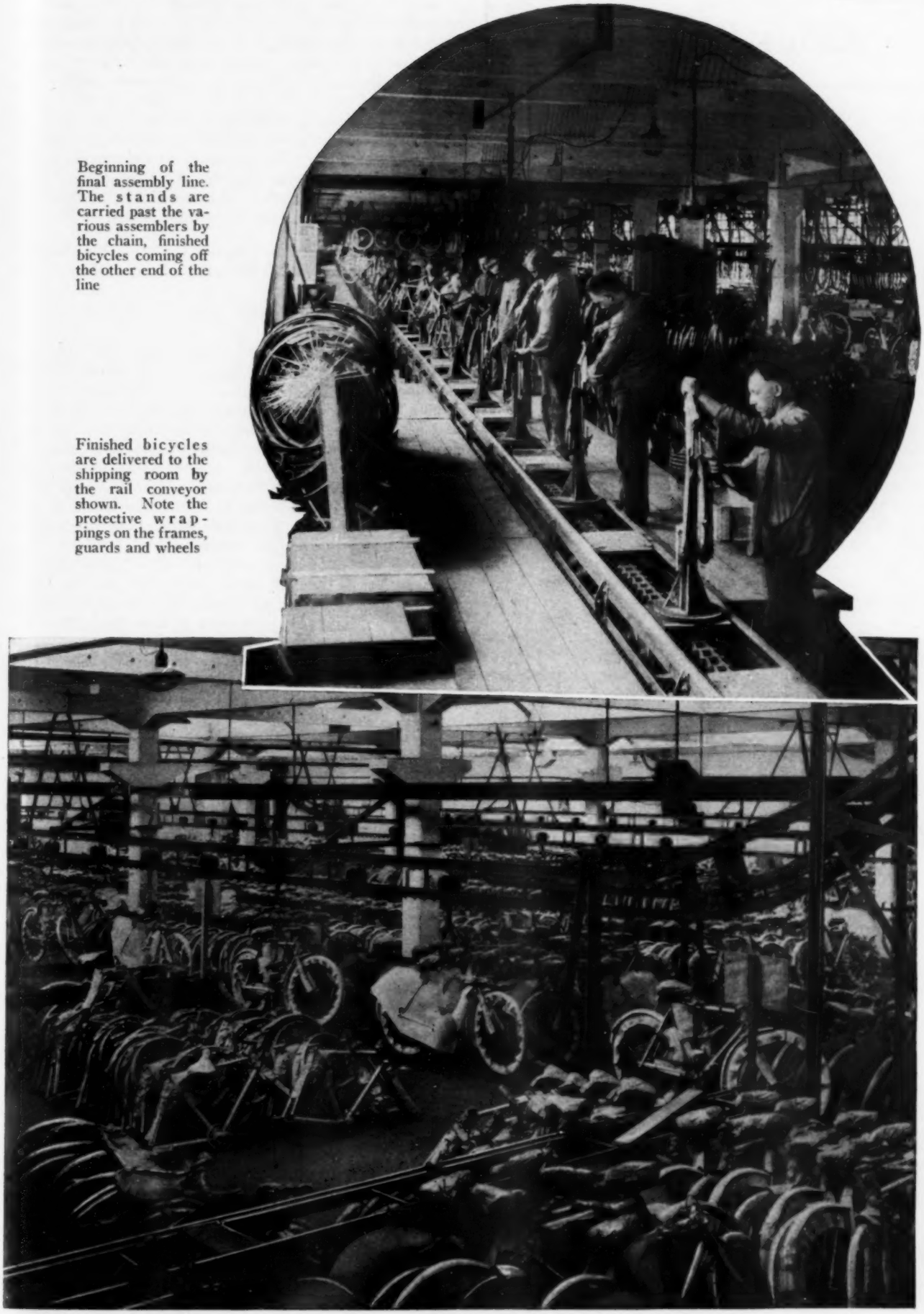
Photographs by courtesy of the Opel Works, Rüsselsheim

One of the tire mounting departments. Wheels come in on the bench chains and the tires are mounted and inflated. They leave on the overhead chain

Overhead chain bringing parts to the wheel department and removing finished wheels

Beginning of the final assembly line. The stands are carried past the various assemblers by the chain, finished bicycles coming off the other end of the line

Finished bicycles are delivered to the shipping room by the rail conveyor shown. Note the protective wrappings on the frames, guards and wheels



· BOOK · REVIEWS ·

LABOR MANAGEMENT. By Gordon S. Watkins, professor of economics, University of California, and personnel counselor, Title Insurance & Trust Company, Los Angeles. Seven hundred and twenty pages, 5½x8½ in. Green buckram binding. Published by the A. W. Shaw Book Division of the McGraw-Hill Book Company, Chicago, Ill. Price, net, $5.

PERSONNEL directors, college classes, and general readers who desire to familiarize themselves with recent developments in the field, are the three broad classes of readers to which this book appeals.

In Part I the problems of labor management and the fundamental assumptions of the best leaders in the field are stated. Part II gives the evolution of employment relations, Part III is a study of the elements of human nature and Part IV is an outline of the principles of labor management, of the organization and functions of the personnel department, and of the qualifications of its manager. Job analysis, labor supply, selection and placement are dealt with in Part V. A wide range of subjects such as turnover, promotions, the plant paper, incentives, stock ownership and other personnel services are covered in Part VI, and Part VII covers industrial government and its relation to trade unionism. Many references are given for further reading.

CONDENSED CATALOGS OF MECHANICAL EQUIPMENT, 1928-1929. One thousand and twenty-two 11x8½-in. pages, containing classified catalog section, general classified directory of manufacturers in the mechanical field, and professional engineering service directory with catalog section, and 4,500 illustrations. Imitation leather covers. Published annually by the American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y. Price to nonmembers $5.

ONCE again this catalog directory, now the eighteenth number, is being distributed. The present edition contains considerably more material than its predecessor, 710 pages of catalog data pertaining to the products of 560 manufacturers being carried. In the mechanical equipment directory over 42,000 separate listings are compiled. Included are all the industrial standardization projects that, on August, 1928, had an official status before the American Engineering Standards Committee.

BOOK OF BUSINESS STANDARDS—By J. George Frederick. Two hundred fifty-five pages, 5x7½ in., cloth-board covers. Indexed. Published by the Commercial Standards Council, 19 Park Place, New York, N. Y. Price $2.

THIS second and enlarged edition of a book covering the important subject of business ethics comes out at a time when there is a decided tendency to bring all business up to higher levels of ethical relationship, and when there is a need for working standards for guidance in the ethics of business. The book has aimed to serve as a guide, and to give specific codes that are in use by some outstanding business organizations.

The book is divided into two parts, one having eighteen chapters dealing with the various aspects of business relations, and the other part giving the codes used by a number of manufacturers and business organizations. Some of the subjects treated include sales standards, employee relationships, cancellation and returned goods evil, interbusiness relationship, bankruptcy evils, and commercial bribery. The analyses given of these subjects indicate considerable investigation on the part of the author, and he gives summations and suggestions in a practical manner. The inclusion of the specific codes gives an opportunity to observe what has already been done towards the adoption of some of the fundamental standards by existing business organizations.

PRACTICAL INDUSTRIAL FURNACE DESIGN. By Matthew H. Mawhinney. Three hundred and eighteen 9x6-in. pages, indexed. One hundred and four figures and twenty-eight tables. Cloth. Published by John Wiley & Sons, Inc., New York, N. Y. Price $4.

FUEL can be conserved to a greater extent than it is at present, according to the author, by a better understanding of furnace operation. From this standpoint and in an effort to clarify the factors entering into the design and use of industral heating furnaces, as distinguished from melting furnaces, he presents this book which is a revision and enlargement of a series of articles that appeared in *Forging—Stamping—Heat-Treating* from December, 1926, to February, 1928. The methods presented are based on data, observations and calculations used with success by the author.

The selection of the source of heat, whether gas, oil, or electricity is the first factor in furnace design. This choice and the method of application together with the furnace capacity are considered in Chapters I and II, respectively, Chapter I being devoted to a historical review. After the fuel and type of furnace have been selected, the method of material handling becomes important. Whether crude methods are used or a conveyor system is installed is primarily a dollars and cents question, and so the problem is treated from this angle in Chapter III. In Chapter IV are presented the various phases of fuel consumption which is in most cases the deciding factor. Materials of furnace construction are discussed in detail in Chapter VI on refractories and in Chapter VII on metal parts. Temperature measurement and automatic control are taken up in Chapter VIII while Chapter XI is devoted to practical problems in furnace design.

KEEPING FIT BY EASY EXERCISE. By George Thomas Everett, Major, U. S. Army, Retired. One hundred pages, 6x9 in. Illustrated, cloth board covers. Published by the Ronald Press Company, 15 East 26th St., New York City. Price $2.

A SMALL book that apparently is worth much. It emphasizes exercise as an important factor of health, and gives 54 exercises by means of which to keep in condition: the shoulders and arms; the trunk; the hips and lower limbs; the body as a whole. The exercises are simple and are illustrated as well as described.

The book was prepared for the man of middle age. According to the author, "these exercises, the result of many years of research, carefully selected for a particular purpose, critically examined by competent physicians, are easily understood, are easy to take, require no equipment and little time, and are so arranged as to offer selections for the exercise of any part of the body, and so varied as to offer choices suitable for any degree of weakness or robustness."

Useful Handling Devices *for the Railroad Shop*

By Frank W. Curtis
Western Editor, American Machinist

A variety of lifting equipment designed to simplify the handling of heavy parts and to save time in loading and unloading machines

SHOP work, like most any occupation, requires a certain amount of physical energy. If the energy required to do a job is transferred from the worker to a machine, or to some form of labor-saving device, it is natural to expect a greater output per man because, after all, humans have only a limited amount of energy. It is on this basis that the Atchison, Topeka and Santa Fé Railway System carries on its repair work, attempting wherever possible to lessen the physical burden of the worker. Operations performed in repairing locomotives resemble job-shop practice, and cannot be handled on a production basis. Therefore, continuous conveyors, and other forms of material-handling devices used for quantity output, cannot be applied in the railroad shop. But there are many devices that can aid the movement of materials in this branch of work. At the Topeka, Kan., shops this condition has not been overlooked, since many forms of lifting and handling equipment, some of which are to be described, are in use throughout the shops.

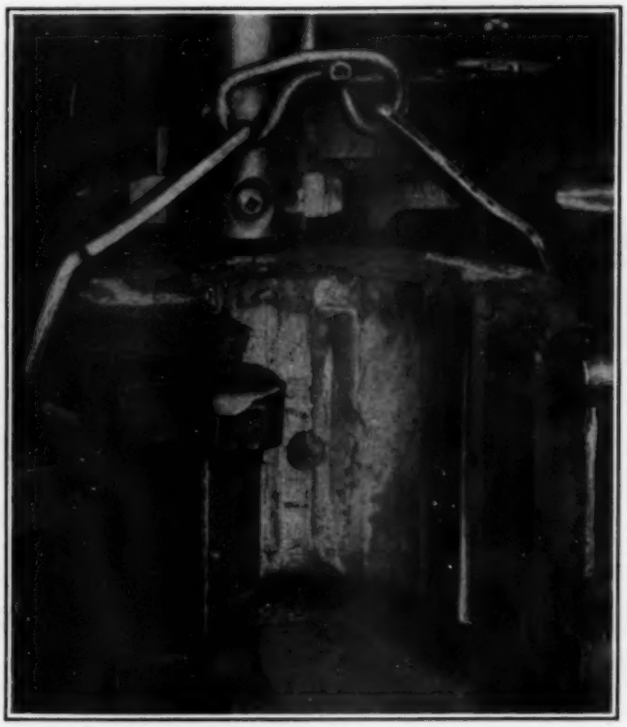


Fig. 1—A simple form of lifting device used for loading and unloading driving boxes on and off a boring mill. The work is gripped at the shoe and wedge faces by formed plates that are connected by an eye. The illustration shows the hooks in use

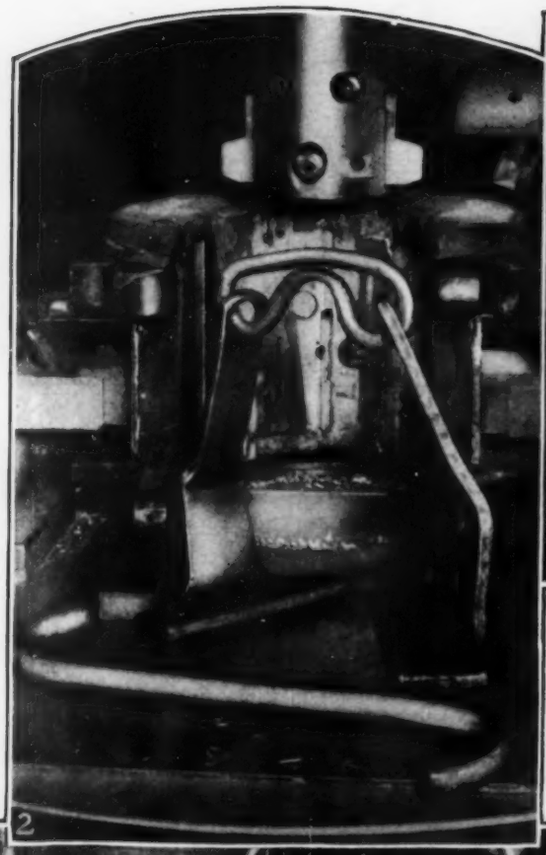
In addition to reducing physical energy, most of the units in use are of a simplified nature, they are easily manipulated, their cost is small, and they save time. To have the correct type of apparatus available when needed is the principle embodied, so that the worker does not have to devise some make-shift means of handling a job.

Driving boxes are lifted to and from boring mills by the hooks, illustrated in Figs. 1 and 2, comprised of two forged plates connected by an eye, and a link for slipping over the crane hook. The plates grip the flanged faces of the work, and are made so that they can be adjusted easily to different types and sizes of driving boxes. Fig. 1 shows the hooks as they appear when attached, and Fig. 2 shows them as they appear when idle.

Another handling unit for driving boxes is the pair of clamps, shown in Fig. 3, which is used in applying boxes to journals. The clamps are of the wedge type and have hardened serrated jaws that grip the inside flange faces when the wedge is raised. The jaws adjust themselves to the width of the shoe and wedge faces, and can be applied to various styles of boxes. One section of the device attached in place is shown at the left, while the lifting unit unattached is seen at the right.

Tires are loaded on, and unloaded from, boring mills by a three-jaw lifting device of the self-gripping type, shown in Fig. 4. The jaws applied to a tire are seen in the lower view, and a near view of their construction is shown above. When applied in place the swivel members hook over the flange of the tire, and the sections to which the chains are attached strike the inner surface, or bore, thus causing a positive grip when lifting pressure is exerted.

A device for handling car wheels to and from a boring mill is illustrated in Fig. 5. A lifting arm, to which a chain and two hooks are attached, is fastened to a vertical plunger located at one side of the machine. The plunger swivels to enable the arm to be positioned over the work, or swung around, as desired. Vertical movement of the plunger is by air, controlled by a valve attached to the lifting arm, thus bringing control within easy reach of the operator. The arm when in use is swung over the work and the two hooks are placed over the flange of the wheel. The plunger is then raised until the load has been freed from the chuck. By swinging the plunger around, the wheel may be lowered on the floor, or on a truck, as required. Units of this kind are being built integrally with modern machines, but the



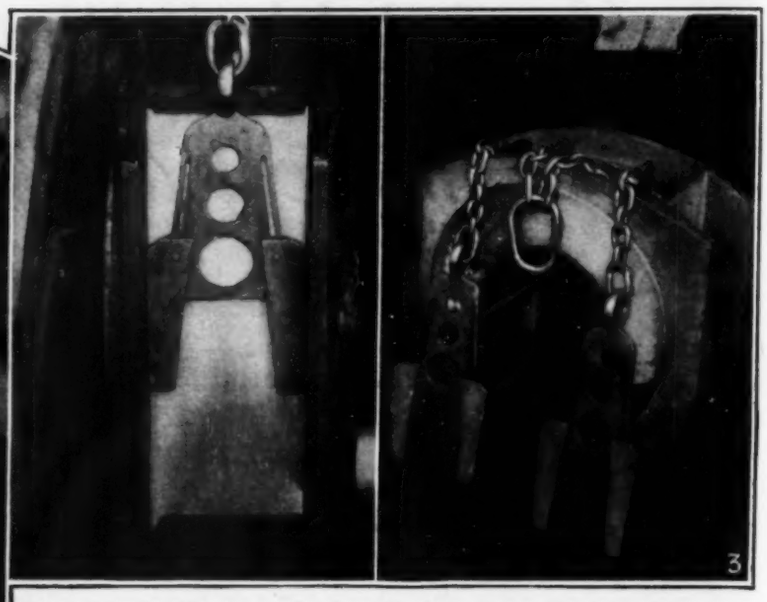
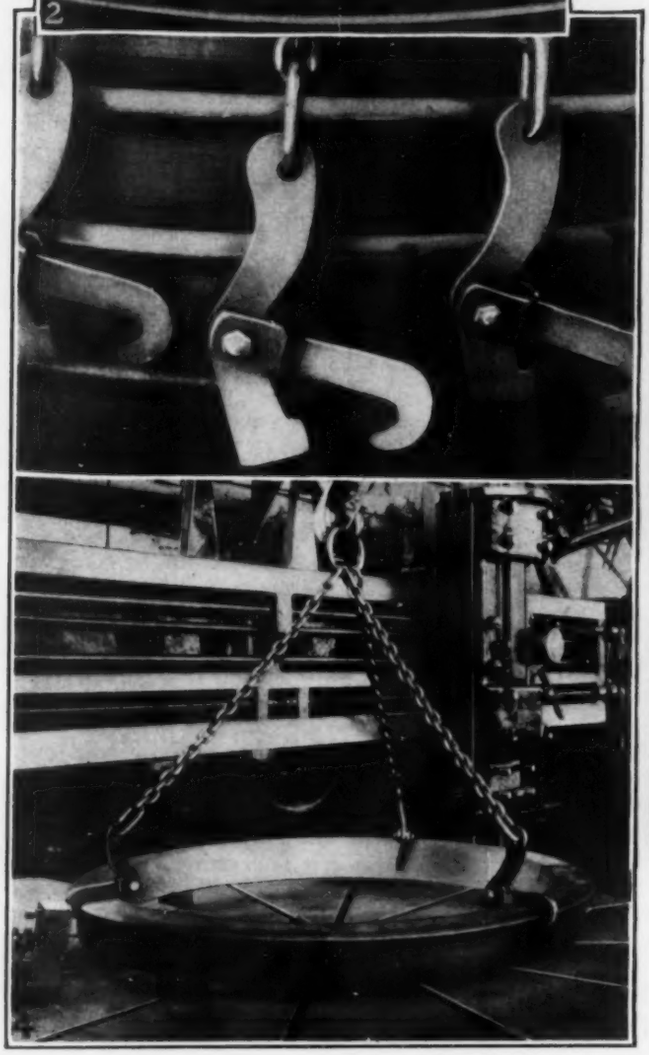


Fig. 2—The hooks of Fig. 1 as they appear when idle

Fig. 3—A wedge-type clamp for use in the assembling of driving boxes to journals. Each section has two hardened serrated jaws that grip the work when the center wedge is raised. The clamps are adjustable to different sizes of driving boxes



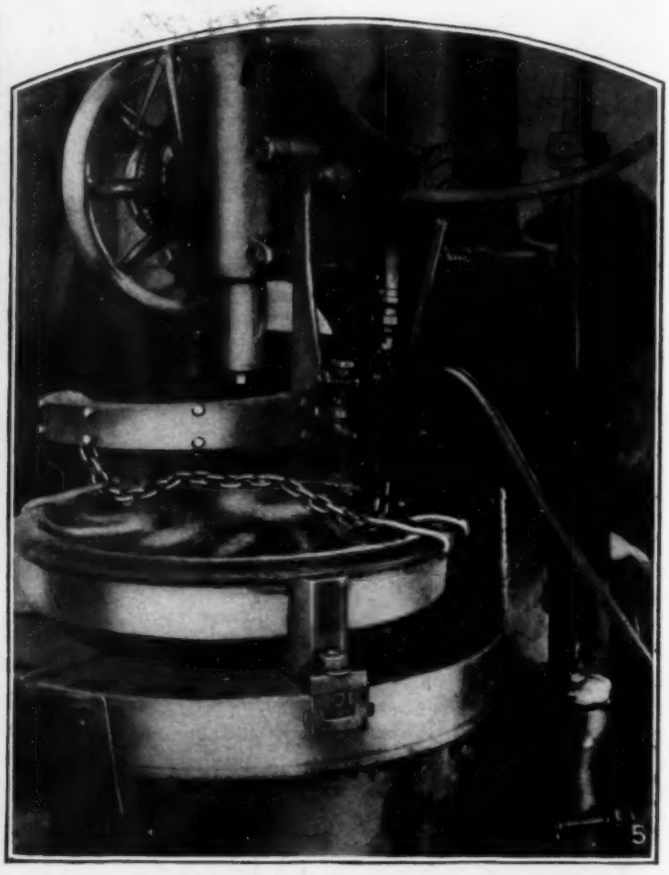


Fig. 4—A set of hooks arranged to transport driving tires to and from a boring mill. The hooks are of the self-gripping type

Fig. 5—A device for loading and unloading car wheels. A swiveling air-operated plunger, located at one side of the machine, carries the lifting arm

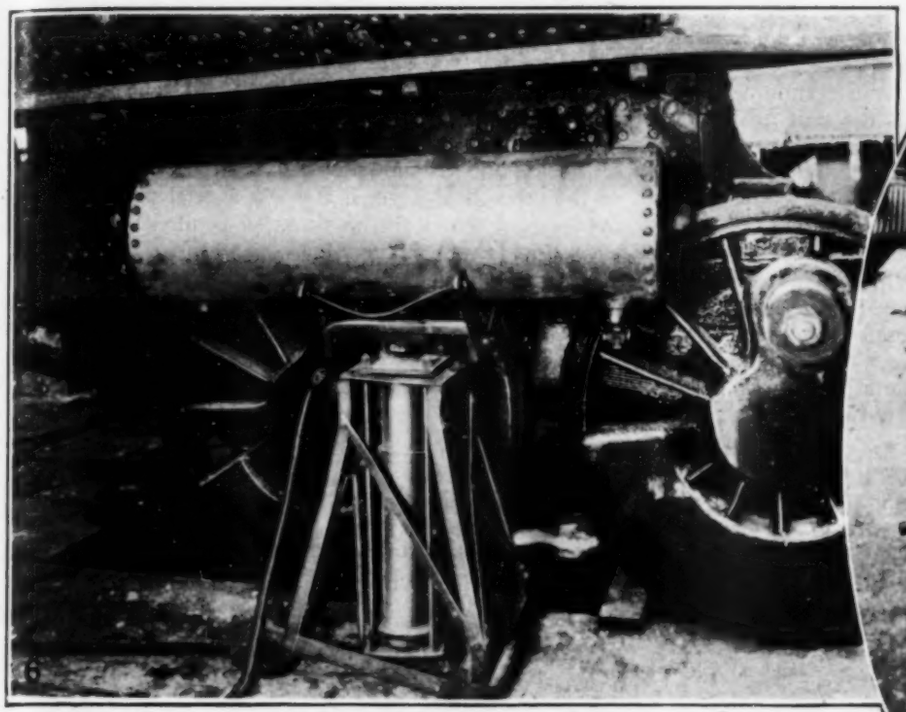


Fig. 6—An air-operated jack that raises reservoirs to running boards, holding them in place until the strap clamps have been attached. By making the jack portable, it can be moved to any pit where an engine is being erected

Fig. 7 — Locomotive stacks are assembled and disassembled by use of this lifting device. It is comprised of two U-shaped clamps designed to fit over the head of the stacks

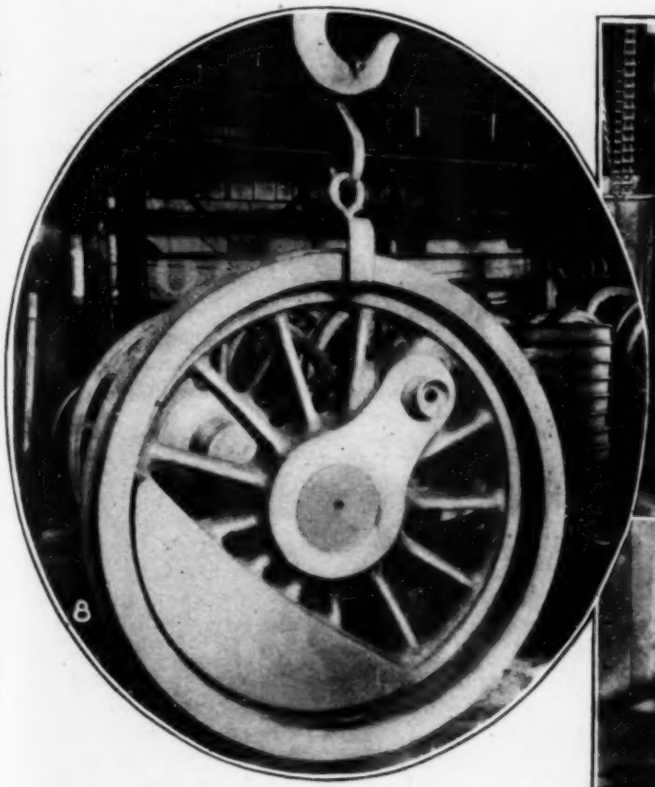


Fig. 8 — A hook designed to handle driving tires while they are being applied to wheels

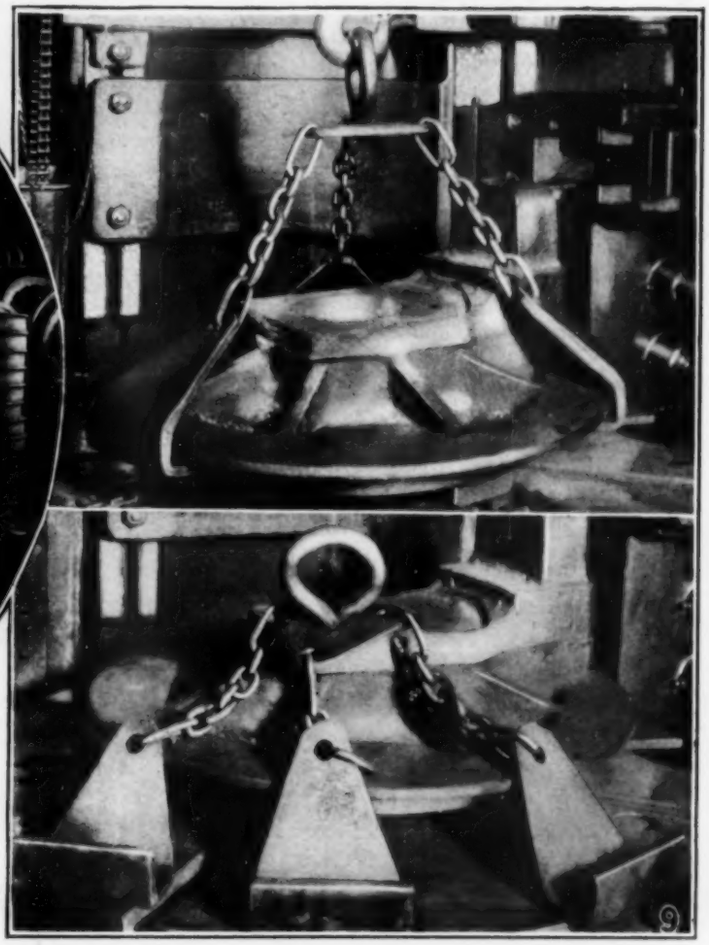


Fig. 9—A lifting device for handling various sizes of cylinder heads. Three forged clamps grip the work from the outside flange as shown

device shown tends to modernize boring mills that are still in good condition, and yet do not have the handling equipment available.

Reservoirs are raised in place to the running board by an air-operated jack that holds the unit against the under side of the board until the strap clamps have been applied. The device, which is portable, is illustrated in Fig. 6 with a reservoir located on the V-plates of the vertical plunger preparatory to being elevated.

A lifting device for removing and applying stacks is shown in Fig. 7. The work is gripped from the upper bead by two clamps that are fastened securely with set-screws. Self-gripping clamps cannot be applied advantageously due to the shape of the part, but the device shown is easily attached and permits rapid handling, as well as a means of simplifying the operation, since no obstruction is encountered at the joining face of the stack.

Locomotive tires are applied to wheel centers by use of the hook illustrated in Fig. 8. Although simple in nature, it offers a quick means of handling.

A lifting device for handling cylinder heads on and off boring mills is shown in Fig. 9. It is similar to some of the other hooks, yet it is for a special purpose. The upper view shows the work as suspended by the hook, and below is seen the unit free.

The handling devices described are not used continuously, but the investment involved is not large as compared to the economic convenience they offer. In addition, they are beneficial from a standpoint of safety, a fact not to be overlooked in shops where large parts are transported.

The Employer and the Workers' Health

IN SPITE of the growing tendency to protect workers against sickness and the loss of wages, the value of industrial medicine is still considered doubtful by many employers. The scheme smacks of philanthropy and useless expense, while the manufacturer is interested in profits and production.

It is cheaper to care for a used machine than it is to buy a new one, and since the human body is a delicate machine, the same rule holds good in regard to it. Moreover, every working man realizes that his chief asset is his health; it is the capital that he invests for himself and his family, and he is eager to keep that capital at its highest earning power. A sick employee becomes an inefficient, discontented individual who may soon be in a mood for striking against his employer, or he may travel from job to job, being proficient in none, and so waste the effort expended upon training him. Because of this and on account of present immigration laws, it has become good business to prevent labor turnover by offering inducements to the worker in order to keep him contented. Industrial hygiene is one of these inducements.

The loss of wages and doctors' bills haunt the wage-earner and with good reason. J. B. Hackett in *Health Maintenance in Industry* states that "the death-rate among the working population increases over that of the general population at the time when the worker should be reaching maximum efficiency. The fact is that under industrial conditions the health of the worker is deteriorating and this leads to an enormous but unconceived loss to every plant." The author quotes the following table from an article by Howell Cheney, of Cheney Brothers, entitled "Industry Profits by Health Supervision:"

Losses Due to Ill Health—Average of 4,500 Employees

		Percentage of Total
Cost of idleness due to sickness	$ 67,500	11.9
Cost of absence from sickness	150,000	26.3
Production loss through sickness "on the job"	50,000	8.8
Loss to worker in wages	162,000	28.3
Loss through reduced earning capacity	40,000	7.0
Medical expense to workers	45,000	7.9
Public expense and charitable relief	56,000	9.8
Total	$570,000	100.0

In "The Blunderbuss of Sickness," Michael M. Davis states that a survey conducted by the Edison Electric Illuminating Company, of Boston, showed that the average worker lost 8.9 days a year on account of sickness. A chart, published by the United States Bureau of Labor Statistics, of a study made of 12,096 families in 92 cities during 1919 shows that $60 was then the average health expenditure of a family of about five persons. Since then the cost of medical attention has arisen considerably. The income of these families ranged from $900 to $2,500 and over, per year, so that the percentage spent for sickness represented an average of 4 per cent of the yearly income.

When the wage-earner's health is lost, the living standard of the entire family is reduced; the children become victims of malnutrition and physical defects, and this, in turn, affects infant mortality and reduces the number and quality of future industrial workers.

Tuberculosis draws its greatest number of victims from the wage-earning group. It attacks especially between the ages of 20 and 40 when the working capacity should be at its highest. The treatment and cure of the disease is a long drawn out and expensive process. According to the National Tuberculosis Association, 99,800 people died of the disease in 1925 in the United States. In order to carry out its campaign of education in the prevention of the disease, the organization is conducting the twenty-first annual Christmas seal sale throughout the country in December.

Uses of Carbon Paste in Welding

THE up-to-date welder is using welding carbon paste regularly in his work. This paste comes in plastic form and does not require pre-heating, but can be formed into any desired shape, and when dry is just as hard as a carbon block. It is especially adapted for use when welding near threaded holes or building up around a weld or any section of a weld, or restricting the flow of molten metal to a desired area. It may also be used for backing-up, for shaping the metal for irregular shaped pieces, and for shimming or holding parts in alignment during welding. Many welders also use it when building up teeth on gears, using the paste for shaping up the space between the fractured teeth. The use of the paste in this instance saves many times the cost, by eliminating milling.

Inspection Methods and Their Application

By Fred H. Colvin
Editor, American Machinist

Transmission gears, starter ring-gears and spiral gears for driving speedometers, are tested on machines of various types in different plants

IN TESTING spur gears for the transmission and similar parts in the Pierce-Arrow plant, master gears are used as shown in Fig. 154. A collection of these is shown on the board behind the inspector. There are also a number of standard disks representing the pitch diameters of mating gears, these disks being used in setting the testing-machine indicator, so as to show whether or not the gears mesh properly at the correct center distance. In Fig. 155, transmission gears are being tested on a Pratt & Whitney tooth-form testing machine, so as to determine whether or not the various finishing processes have left the teeth in correct form. This testing machine is easily operated and is tilted so as to make it easier to read the dial gage.

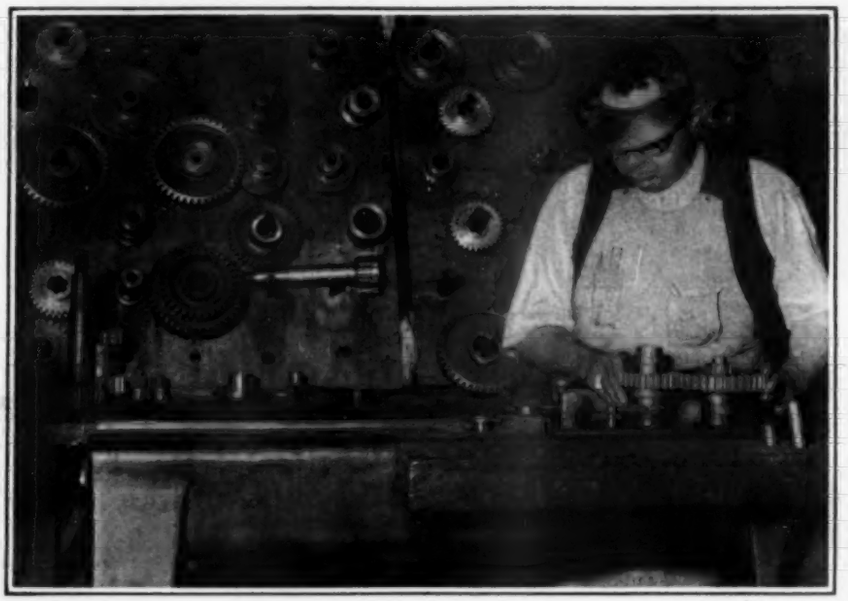


Fig. 154—Testing transmission gears in the Pierce-Arrow plant. Each gear is rolled in mesh with a master gear. Some idea of the number of master gears used in testing may be had from the board at the rear

The spiral gears used in driving the speedometer shaft are being tested on the device shown in Fig. 156. A master pinion forms part of the testing fixture, and the handle on top enables the inspector to test the feel of the gear action with the pinion in different positions. Starter-ring gears are given two tests at the Pierce-Arrow plant. In the first test, the ring gear is tested before being mounted on the flywheel, on a Morse testing machine, as shown in Fig. 157. The ring gear is mounted on the revolving plate shown so as to mesh with the starter pinion, and any eccentricity of the ring, or

Conclusion of the tenth article. The eleventh will appear in an early issue.

Fig. 155—Gears being tested on a Pratt & Whitney tooth-form testing device. The dial indicator shows the amount of deviation from the correct form of tooth.

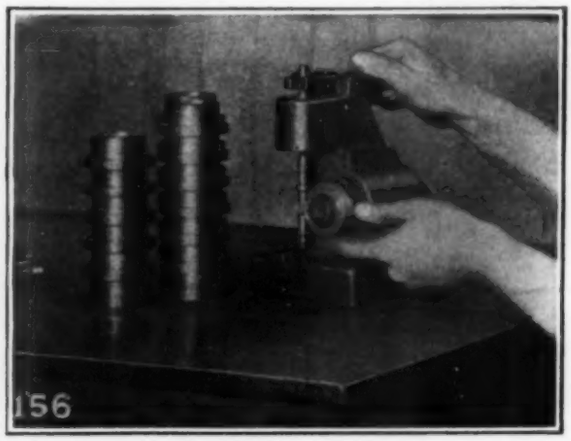


Fig. 156—The gears for driving the speedometer are tested for backlash in the Pierce-Arrow plant. The large gear can be tested with a master pinion or with its own pinion

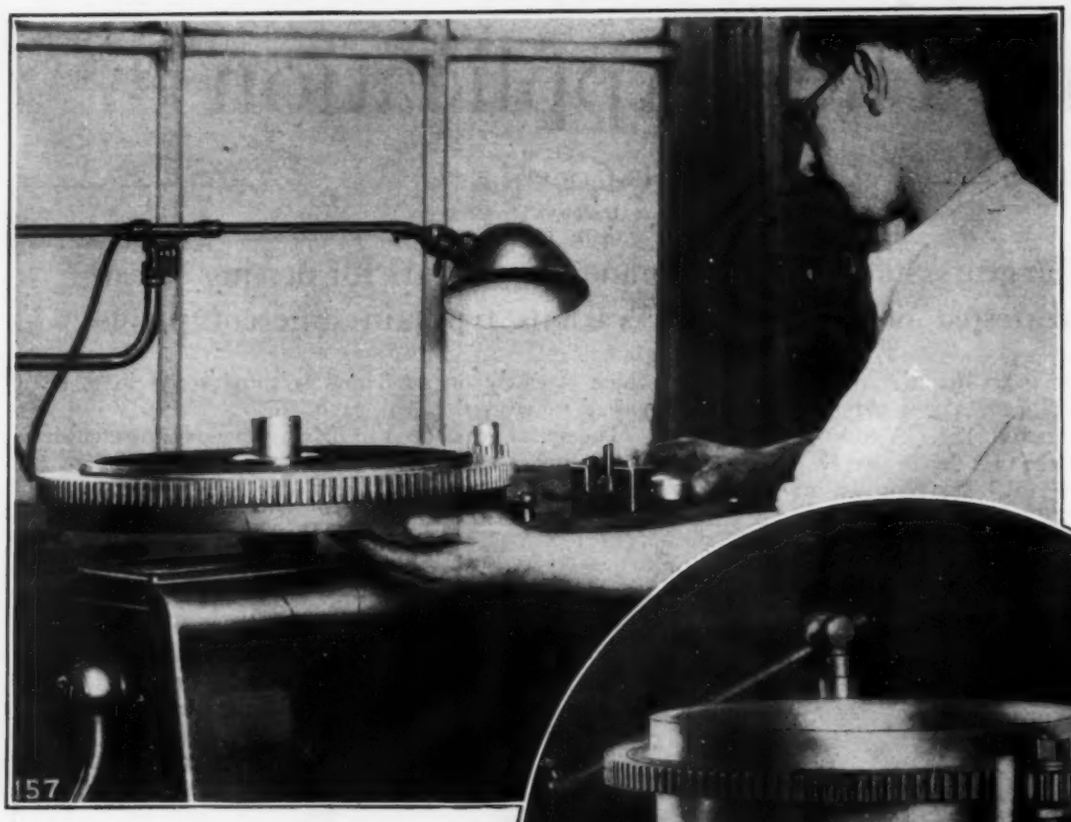


Fig. 157—Inspecting the Pierce Arrow starter gear before it is mounted on the flywheel. The ring gear fits a master wheel mounted on a Morse gear tester and is checked against a standard pinion. A gage shows any eccentricity

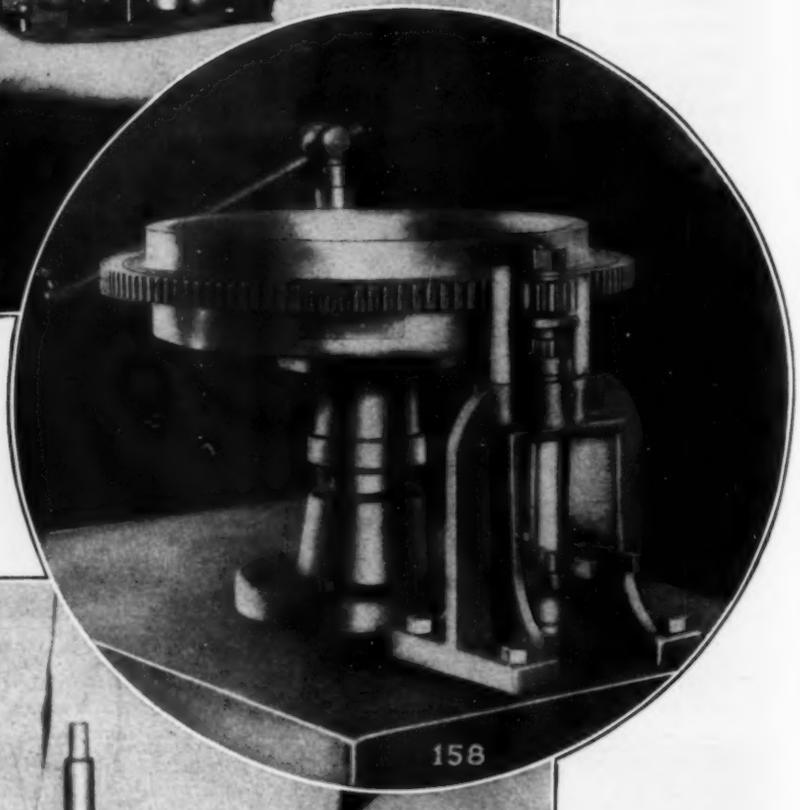


Fig. 158—After the starter gear has been mounted on the flywheel, it is tested again as shown. A master pinion is used and an indicator mounted on the arm behind the flywheel, is used to check any eccentricity or wabble

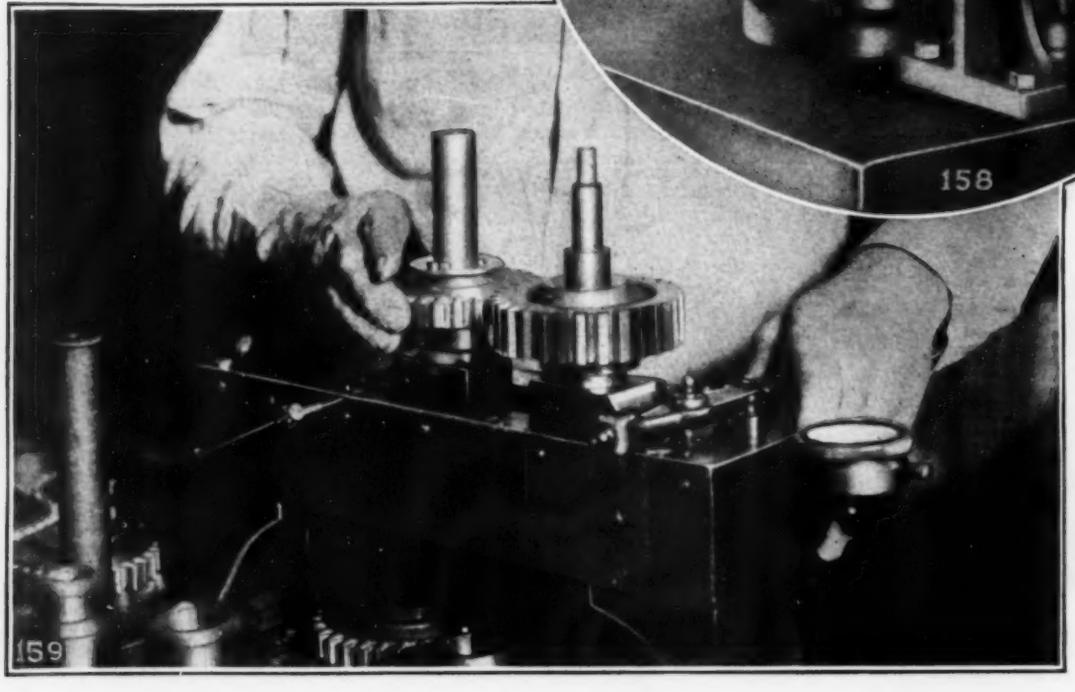
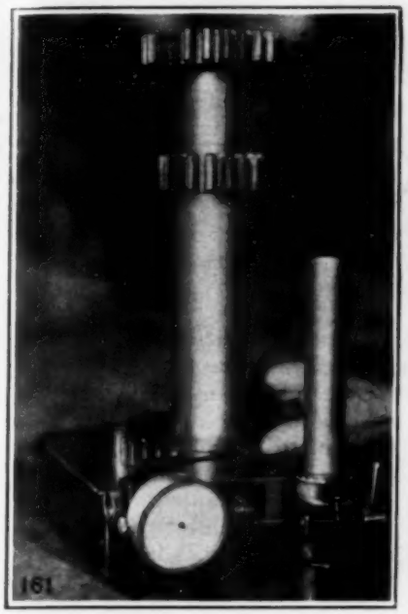


Fig. 159—Testing gears at the Warner plant. The running of the gears can be "felt," while any irregularity will be indicated by the dial gage at the end. Pressure for eliminating backlash can be applied by the lever shown at the right



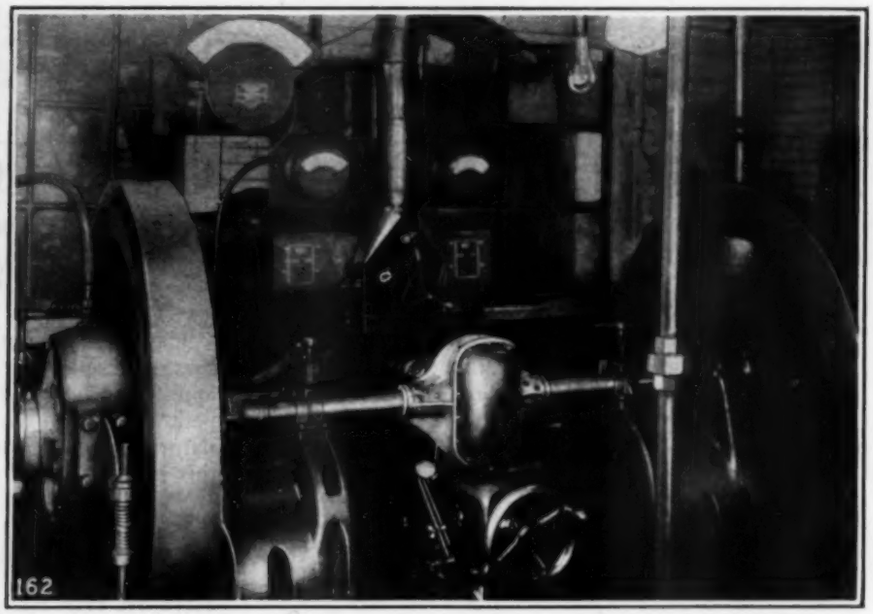


Fig. 161—The Lees-Bradner odontometer is also to be found in the Warner plant. Although working differently from the device in the preceding figure, it also checks the correctness of the tooth form. Fig. 162—A final inspection of the differential and driving gears is made in the stand shown, in the Franklin plant. The propeller shaft is driven by an electric motor and the power transmitted can be varied by brakes, and weighed

Fig. 160—Another form of gear testing machine in the Warner plant. Here the cluster gear remains stationary and the plate carrying the gage is revolved by hand. The correctness of the tooth form is shown by the dial indicator

any movement due to irregularities in the piece, is shown on the dial indicator at the inspector's right hand. He turns the starter ring slowly with his left hand while he watches the indicator.

After the starter ring has been shrunk in place on the flywheel, the combined unit is tested on the fixture shown in Fig. 158. This test checks practically the same variations as the first test, except that it deals with the completed unit. A small clamping brake is provided at the bottom of the starter-pinion shaft. Although the test indicator is not shown, it is mounted on the arm behind the flywheel and can be used to check both eccentricity and wabble of the flywheel.

The testing machine used by the Warner Gear Works for spur gears, is shown in Fig. 159. This machine is of usual construction, a dial indicator showing any change in center distance due either to eccentricity, or to irregularity in the size of gear teeth. The indicator is first set by master gears, and one of the master gears is then used to check the running of the mating gears of those produced for new sets.

Another form of testing machine is shown in Fig. 160, where the tooth-form is being checked by means of the device shown. With the gear remaining stationary, the table carrying the bell crank feeler *A* is moved around a central column, an indicator on the small end of the bell crank following the form of the tooth. Variations are indicated on the dial gage, so that errors in the tooth curve can be readily checked.

Another type of gage for the same purpose is the Lees-Bradner odontometer shown in Fig. 161. Although the indicating mechanism is somewhat different from that in the machine just described, it performs the same function of showing when the outline of the tooth departs from the normal curve. The checking device is clamped to the post, and the gear is turned to test its form.

One method of final inspection, this time of the gears in the completed rear-axle unit, as conducted in the Franklin plant, is shown in Fig. 162. The gears are driven by an electric motor and load is applied to disks that take the place of the rear wheels. This apparatus weighs the load transmitted by the gears, and the indicator below the transmission case checks the amount of vibration.

The various devices and methods shown indicate clearly the extent to which the elimination of gear noise has become part of the building of automobiles.

Some Important Points in Machine Tool Cost Accounting

By Albert E. Grover

Staff Cost Consultant, National Machine Tool Builders' Association

THE first consideration of every machine tool builder is profit, and the source of that profit. First we arrange the accounting system so that our Profit and Loss statement will show classes of profit, then segregate the profit accruing from manufacturing and marketing into classes of product, further segregating to individual units where the circumstances warrant. Bear in mind that today's market on materials, labor and burden must be used in figuring costs of current sales, if we do our part in establishing a profitable sales policy in the industry. We purchase a quantity of material at a price below that prevailing when the material is used in production. If we use this advantage as a "club" to get business, we not only establish a precedent that tends to demoralize the whole industry but our own chances for repeat orders are placed in jeopardy when this lot of material is exhausted. Would it not be better to charge our costs with the market price prevailing when we use the material in manufacturing, and charge the difference between that amount and the actual cost to "Purchasing Profit"?

Machine tool plants are so much like many other plants in the metal-working industries that an analysis of their costs applies with equal force to the costs of the other plants. This abstract, greatly abridged from the original paper, is the first of three articles on the subject of cost accounting that will be published before the end of the current year

The next two items on the Profit and Loss Statement, "Building" and "Equipment," are the differences between depreciation taken into costs on reproduction value and depreciation computed on cost of acquisition. By setting up this amount as a profit we are able to charge depreciation on replacement values to production operations through our regular accounts, and at the same time satisfy the rulings of the internal revenue bureau. In effect we are reporting depreciation on cost values. We are also displaying to our officers, monthly, advantages in profit due to having purchased buildings and equipment below the market of today.

Here again, is it not better to charge our costs with the present value of the utility we are consuming for the customer's benefit, and show the difference between that amount and the acquisition cost as a purchasing profit—which it really is?

Sale of scrap and by-products, sale of outside investments and interest on them are self-explanatory.

The cost of maintaining excess capacity is not a proper charge to operating expense; its inclusion in the burden application will increase the cost figures. But our competitors who do not have the expense of excess capacity naturally have no such item to reckon with. Showing this segregation on the monthly statement of loss due to excess capacity often spurs the organization on to more effectual sales activities. Again we bump up against the rulings of the internal revenue bureau which, justly, considers interest on investment as an income. By accumulating the monthly charge to costs, and showing it as an income in our statement we are in effect setting up an income on which to pay taxes. Good business practice contemplates the establishment of selling prices requiring the customer to pay a price for his machine tools that will cover the cost of material, labor, and burden plus an investment income and real profit from operations. In order that the variations in investments in the different production centers may earn their proper share of this investment income, operations through which the product flows must bear their proportionate share of the interest on investment used in the operation.

Manufacturing costs are divided into material, labor and burden. As mentioned before, material is charged to cost at prevailing market when the material is used in production. Direct labor is charged at cost, and needs no further comment here.

Burden is charged to manufacturing cost on the basis of normal operating hours of production centers through which the individual parts and assemblies flow. Only plants manufacturing one article, and one size of that article, can secure accurate costs of finished product by distributing manufacturing burden on the basis of the direct labor or direct labor hours represented in each article. However, that result would be an unsound basis on which to establish a selling price if the cost of any excess capacity is included in the burden rate calculations.

The burden cost of each department is divided into three classes, representing the bases of distribution necessary to state correctly the cost of operations on the product. These classes are—

A paper read at the Convention of the National Machine Tool Builders' Association, Cresco, Penn., October 25, 1928.

(1) Buildings—A place for the man to work
(2) Equipment—Tools for the man to work with
(3) General—Supervision and clerical effort necessary to plan and record their activities; also supplies and other expenses in maintaining workable conditions in the departments.

Building expenses consists of—
- Depreciation on buildings
- Taxes on buildings
- Insurance on buildings
- Interest on investment in buildings
- Repairs to buildings
- Lighting
- Heating.

The total cost of this expense of furnishing a place for the men to work is distributed to production centers on the basis of area occupied by each.

Equipment expense consists of—
- Taxes
- Depreciation on machinery and tools
- Taxes " " " "
- Insurance " " " "
- Interest on investment in machinery and tools
- Repairs to machinery and tools
- Power.

Depreciation, taxes, insurance, and interest-on-investments are allocated to production centers on the basis of the reproduction values of machinery and tools.

Repair costs, both material and labor, are charged directly to production centers.

Power cost is taken up among the production centers either through the use of individual meters for each center or by calculations based on the normal hp. required to operate the equipment in the center multiplied by the hours operated.

General expense consists of—
- Supervision
- Taxes
- Insurance
- Interest
- Supplies
- Indirect labor
- Office salaries
- Etc.

Supervision is the cost of effort in planning and supervising the activities of men engaged in manufacturing.

Taxes, insurance and interest cover fixed expenses on investment in inventories.

Supplies are those items of material that are used in production centers, and are not an integral part of the machine tool being made.

Indirect labor is the cost of all effort not used directly in producing. This item of burden does not include supervision or office salaries.

Office salaries is the cost of clerical effort in making out production orders, time keeping, payroll, inventory records, costs and the portion of the general bookkeeping in connection with manufacturing and accounts payable record.

All general manufacturing expenses are distributed direct to production centers.

The sum of building, equipment, and general burden applications to each production center, divided by the normal operating hours of the center, will result in a rate of burden that is practical to use in cost and estimate calculations.

If we distribute the total building, equipment and general classes of burden to departments on the basis of total production hours, the result would be a uniform rate for all departments. By this method the foundry and assembly departments would be loaded with the cost of operating the expensive equipment in the machine shop, and the result would be to increase the apparent cost of castings and decrease the apparent cost of machining.

Many manufacturers, and sometimes professional accountants, claim that as long as the company markets only assembled machines this method produces the same cost as the production center-distribution method. This conclusion would be true only if all parts of different machines made require uniform operations; and those operations, where too much burden is applied, are offset by other operations where the burden is understated. As stated before, this might satisfactorily apply where the machine tool builder makes only one kind of machine and one size of that kind. But again we repeat that where more than one size of machine is made some of the operations on one size will take more expensive equipment than the same operations on another size, and if correct costs of each size of machine are to be had, the higher cost of operating the more expensive equipment must be applied to the product requiring them.

Manufacturers in general will agree that the principle of production center burden application is sound, yet a majority of these same manufacturers will offer one or the other or both of two excuses for not practicing the method in their own plants; "my business is different," or "it costs too much clerical effort."

Your business may be different from that of other machine tool builders, yet you have a machine shop where you use machines that vary in floor space occupied, capital investment, repairs and power. So in this respect you are like all machine tool builders, and the principles of burden application that are sound for the industry are sound for you.

The second excuse, concerning the extra cost of clerical effort required to distribute burden correctly, has no merit.

You spend large sums in engineering and sales promotion to place a machine tool on the market, yet you say it costs too much to know exactly whether the income from its sale is sufficient to cover the cost of material, labor, and burden (distributed correctly) leaving a balance sufficient to replace the worn-out buildings and equipment caused by manufacturing this machine, and a satisfactory dividend for your stockholders.

In 16 years of industrial cost system installations, I have had an opportunity of supervising the establishment of production center burden applications to machine shop operations, in many plants. To my knowledge, not one of those manufacturers returned to the old inaccurate methods. Therefore it is reasonable to believe they found the results sufficient to warrant the small amount of extra clerical effort required.

Nearly every phase of industry has its hazard. Fortunately, there always seems to be an antidote or preventive available that makes it possible to use the new processes without taking toll of human life or comfort. Chromium plating causes nosebleed and ulcerated sores with some operators. But effective ventilation, with an air velocity of 2,000 ft. per min., is said to usually prevent these troubles. It is also advised that rubber gloves, aprons and shoes be worn while chromium plating.

· TECHNICAL · ABSTRACTS ·

"Perminvars," a Group of New Magnetic Alloys

Great scientific and technical importance is ascribed to the discovery of new magnetic materials known as "perminvars" at the Bell Telephone Laboratories, Inc. Several of these perminvars have extraordinary magnetic properties which are particularly suited for uses in electrical communication circuits. An example is the composition containing 45 per cent nickel, 25 per cent cobalt, and 30 per cent iron, which has in addition to unusual magnetic qualities a high initial permeability.

The properties of the perminvars are developed entirely by heat-treatment. The alloys are heated at 1,000 deg. C. for a short time and then cooled. The rate of cooling from 600 to 400 deg. C. determines the degree to which these properties are developed. The best results are obtained when the rate is such that it takes about 5 hours to cool through this temperature range. With faster cooling the properties are less marked. Above 600 deg. and below 400 deg. C. any convenient rate of cooling may be used, but it must not be so rapid that strains are set up in the alloy.

For magnetizing forces below 1.7 gauss, the permeability of the alloy mentioned is substantially constant, the variation being less than 1 per cent. This constancy is remarkable for a magnetic material having an initial permeability approaching 500, and therefore, nearly double that of iron. Another property of the perminvars is the extremely small hysteresis loss in the range of magnetizing forces and flux densities in which the permeability is constant. It is noteworthy that while silicon steel and "Armco" iron both have considerable areas within the hysteresis loop, it has been shown that the hysteresis losses for the perminvars are very minute and that they are less than that for Permalloy.—*Bell Laboratories Record*, September.

What Age Executives?

It was recently brought out in a parliamentary debate in London that the average age of the ten men controlling the ten largest companies in the heavy trades is 76 years, and that the average age of the directorate of one of the leading English railways is 70 years.

Only a random comparison can be made, but it is apparent that the average age of American executives is a great deal under these figures. Ten of the largest corporations in this country are managed by men whose average age is 58½ years, it has been determined. The oldest of this group of executives is W. B. Storey, 70, president of the Atchison, Topeka and Santa Fe Railroad, and the youngest is Walter S. Gifford, 43, president of the American Telegraph and Telephone Co. All of them are in full charge of the operation of their companies, although some of them may not be in control in the same sense that the English executives are. In the analysis it was also revealed that industrial corporations are managed by younger men than are railroad companies. — *The Magazine of Business*, October.

Unusual Baked Finishes for Metal Parts

It has been stated that crystallizing lacquer is one of the lowest cost finishes that has ever been produced. The savings come not so much in the application as in the work that may be omitted in preparing the surface for finishing. Not only is this true, but many beautiful effects may be produced.

Crystallizing lacquer has a China wood oil base and in this respect is similar to crinkled japan. The oil acts in a peculiar manner when placed in an oven having an open-flame gas burner. The action of the gas flame on the lacquer causes a crystal effect to take place on the surface of the wooden or metal article. The size of the crystals produced can be controlled at will by applying a thick or thin coat of the material. As soon as the crystal is formed and when the finished design is produced, the oven is opened and the baking continued as long as necessary in order to produce the surface desired.

Crystal lacquer can be applied over a comparatively rough surface and will produce nearly as satisfactory a finish as if it were applied over a smooth surface. Almost any dark color can be produced with this material by applying a coating of colored ground japan as an undercoat and then following it with a coating of transparent crystallizing lacquer. The material may also be applied on top of any kind of an undercoat such as shellac, stain, nitro-cellulose, lacquer or varnish. Its use may be extended to porous materials provided that some coating be introduced to seal the pores. It is stated that the crystallizing lacquer is more durable than varnish, and is waterproof. It may be brushed on, but the most common method of applying it is with a spray gun. For small production a cup-type spray gun may be used, but for large production a 1- or 2-gal. pressure-type spray is best, equipped with an air-conditioning apparatus.

Crinkled japan is closely related to crystal japan, but produces a finer and more refined effect. As the name implies, it has a very uniformly shriveled appearance. Variations of this finish are made by spraying a bronzing liquid or lacquer in colors over the base of crinkled undercoat. — W. J. Miskella, *Fuels and Furnaces*, October.

Aluminum-Silicon Alloys

Aluminum-silicon alloys have been used for only about six years. It was discovered that whereas aluminum silicon alloys containing about 87 per cent aluminum and 13 per cent silicon were relatively coarse-grained when cast normally in sand and relatively weak, they were fine-grained, strong and tough, when treated in the liquid state before casting with a small quantity of sodium fluoride. About 2 per cent by weight of sodium fluoride was added. The resulting eutectic was so fine that the silicon was found undissolved when viewed under a microscope. The white spots, which were plainly seen, indicated pure aluminum that contained some silicon in solution. The same results can be obtained by adding metallic sodium. The sodium is supposed to dissolve to a certain extent in the liquid aluminum and, on cooling, separates out into very fine particles which interfere with the free crystallization of the silicon to such an extent that the eutectic freezing point is lowered. Thus an alloy near the eutectic composition is changed to one in which the final structure is excess aluminum plus eutectic instead of excess silicon plus eutectic. This "modified" eutectic then will be richer in silicon than the so-called normal eutectic. The 13 per cent silicon alloy in the modified condition has a tensile strength of from 25,000 to 30,000 lb. per sq.in., elongation of 5 to 10 per cent, approximate yield point of 11,000 lb. per sq.in., and Brinell hardness No. 60. All aluminum-silicon alloys are fluid in the liquid state.

Because of the characteristics mentioned above, the aluminum-silicon alloys are used very extensively for pressure die-castings. The walls of such castings are very thin, and it is desirable to have great fluidity of the molten metal because the tendency to crack in the die-casting process during freezing and shortly thereafter is considerable. The use of these alloys marks a considerable advance in the art. The severe chilling brought about in a pressure die or in a permanent mold refines the structure of these alloys somewhat like the addition of sodium, so that better physical properties are obtained than in sand-cast and modified alloys. Unmodified alloys containing up to 2 per cent silicon are extensively used in chill molds. The tensile strength of the die-casting alloys runs from 25,000 to 30,000 per sq.in., while that of the alloys used for permanent molds varies from 18,500 to 28,000 lb. per sq.in. For this type of molding, some compositions contain small parts of copper, iron, magnesium and tin.—Zay Jeffries, *Mechanical Engineering*, September.

IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Horses Made from Scrap Pipe

By James Lewis

Almost every shop has use for the so-called "carpenter's horses." By welding together scrap lengths of pipe, substantial horses, such as the ones shown in the illustration, can easily be made. Four lengths of pipe, about 3 ft. long (preferably 2 in. in diameter, but any size over 1 in. will do) and one length about 4 ft. long are needed for each horse. The pipe is cut to length and the ends are beveled for welding by means of the oxyacetylene cutting torch, which is also used to cut off the ends of the legs, so that the horses will stand without rocking. After the legs have been cut to the proper angle, they are welded to the crossbars with fillet welds. No cross braces are necessary. A durable work bench for the shop can be made by laying planks across the tops of two or three of the horses.

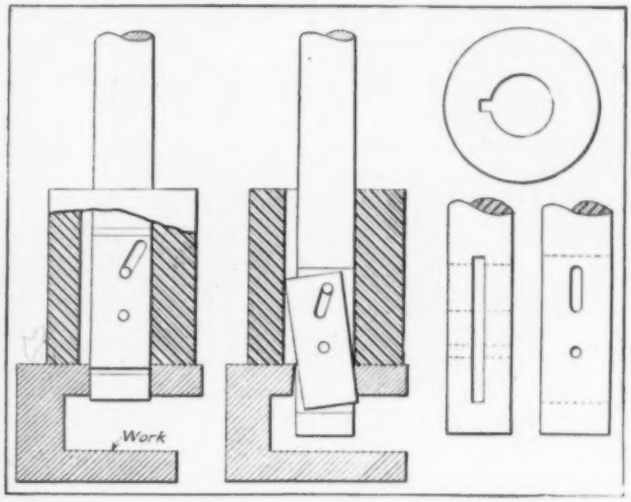
Horses made by welding

A Taper Boring Tool

By H. Moore
Hamilton, Canada

In making some machines to be used in connection with the manufacture of shoe laces, some of the parts were required to have taper holes, the largest part of the taper being at the under side. At first we tried a bar having an inserted taper cutter, but had difficulty in inserting and removing the cutter, owing to the limited size of the opening in the work.

We then made the tool shown in the illustration. It consists of a boring bar, a pivoted cutter, two pins and a sleeve. The bar is slotted for the cutter, and at 90 deg. from this slot are a vertical slot and a hole for the pivot pin. The sleeve is a sliding fit on the bar, and the hole is grooved on one side to provide clearance for the cutter as it swings on its pivot. The cutter has a diagonal slot and a hole for the pivot pin. The pin that goes through the vertical slot in the bar and the diagonal slot in the cutter, also goes through the sleeve, and is a tight fit therein.



Tool for boring tapers

In operation, the tool is entered in a hole previously drilled, until the sleeve comes in contact with the work. Further downward motion causes the cutter to swing out gradually, due to its riding on the pin through the diagonal slot, thus boring the hole taper. After the lower end of the cutter has passed through the hole, it continues to swing until the top of the diagonal slot comes in contact with the pin that passes through it. By this action the side of the cutter takes a full bearing in the hole and acts as a reamer, taking out any roughness due to the boring.

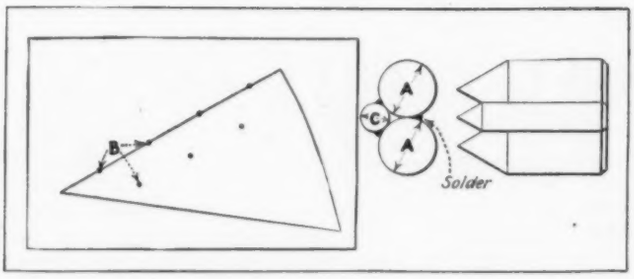
In entering the tool in the hole, the weight of the sleeve keeps the pin at the bottom of the diagonal slot in the cutter, keeping the cutter in its neutral position, and likewise returns the cutter to that position as the bar is withdrawn.

A Spacing Punch for Diemakers
Discussion

By Charles Kugler

I believe that the triple center-punch shown in the illustration has many advantages over the punch described by John F. Bell, on page 513, Vol. 69 of the *American Machinist*, for the following reasons:

Three pieces of drill rod and a little solder are the only materials required. It is not necessary to measure the distance between the first two punch marks. The



An improved spacing punch

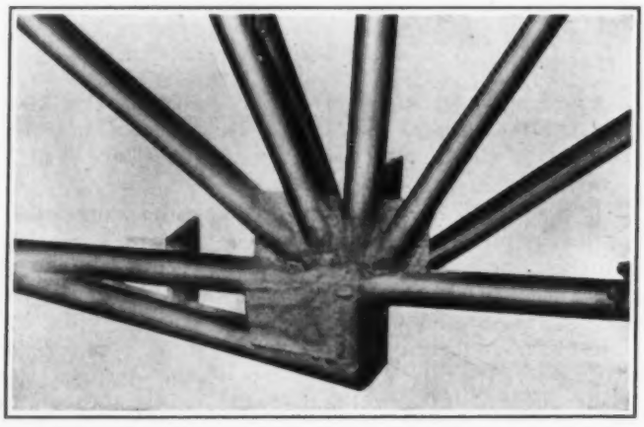
two punches *A* are set on the line. Tapping all three punches with a hammer produces the marks as shown at *B*. The diameter of punches *A* must always be the same as that of the drill to be used. The diameter of punch *C* can be calculated by the following formula: $C = A \times 0.4138$. A piece of wire is wrapped around the punches to hold them while they are being soldered.

It should not take long for a diemaker to accumulate a sufficient number of these punches to take care of the various sizes of drills used in drilling out die cores.

Welded Struts for Airplanes

By Charles Hayes

All the new designs of airplanes used by the United States Army have welded-steel struts for the fuselages. This type of structure lends itself to quantity production



Airplane struts anchored by welding

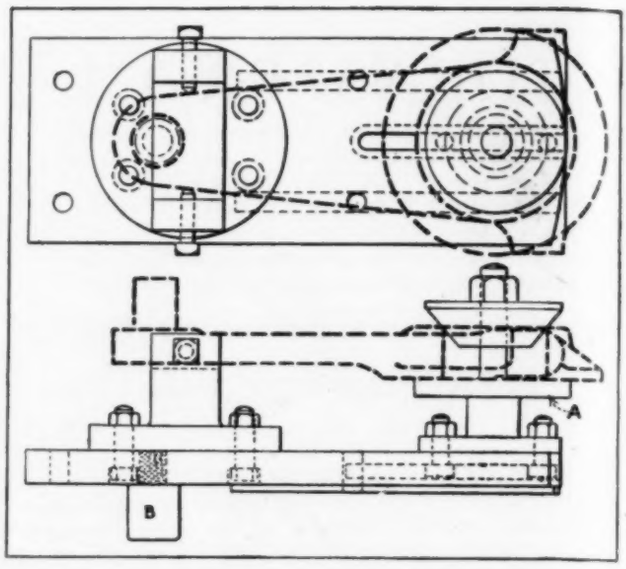
and is, on account of its strength, admirable for airplane design. Several members can be joined together at one place without any decrease in the strength of the tubing.

Fixture for Eccentric Cranks

By W. R. Millican

The illustration shows a fixture used in the Parsons, Kan., shops of the Missouri-Kansas-Texas Lines, for machining the pin bearings of eccentric cranks. The large end of the work is located and clamped against the shoulder of the stud *A*, which is arranged to slide on the base of the fixture, so as to accommodate the various sizes of eccentric cranks in use. The work is centered on the stud by a tapered collar which seats itself in the hole.

The smaller end of the work is aligned and held in place by two pointed setscrews so that the pin to be



A convenient fixture for machining eccentric cranks

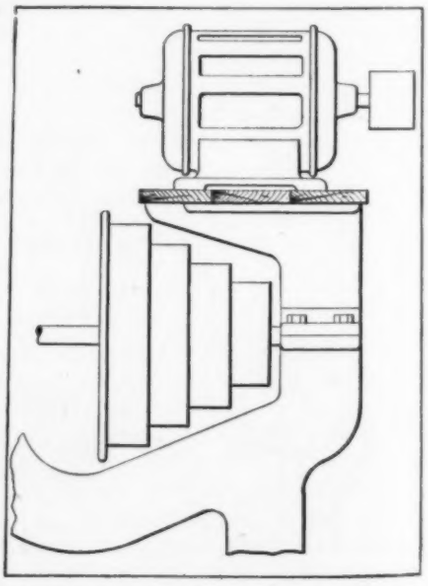
machined can be aligned with the machine spindle. Alignment of the fixture in the machine is by the stud B. With the work in place, the machining is done with either a hollow mill or a single-point tool.

Motor Drive for Upright Drills

By Donald A. Hampson

Many machine tools have been arranged so as to be driven from a motor, instead of from a countershaft. In some cases the work has been neatly done, in others it is decidely "patchy." A neatly designed drive stands out as an example of careful thought, just as the patchy job cries loudly of its shortcomings.

A number of 20-in. upright drills in a Michigan shop have been equipped with the motor drive here illustrated. The upper horizontal shafts of such upright drills have two or more bearings each, often of the split type. In this case, the rear bearings were split in a horizontal plane. The caps were removed, and in their places were put ribbed castings that flared both outwardly and toward the front, besides having the cap forms at their bases. Across the tops of the flaring ribs wood platforms were placed and on them the motors were mounted. With this arrangement, the motor pulleys drive to the tight pulleys on the lower horizontal shafts.



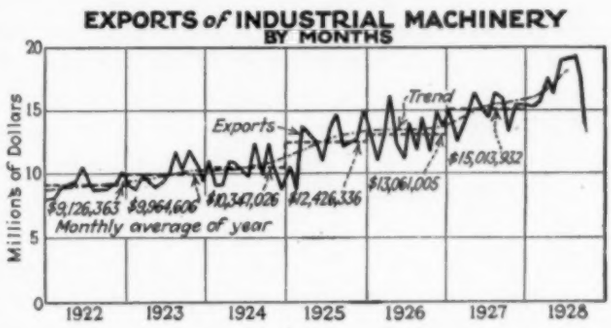
Application of motor to an upright drill

Activity in the Metal-Working Industry

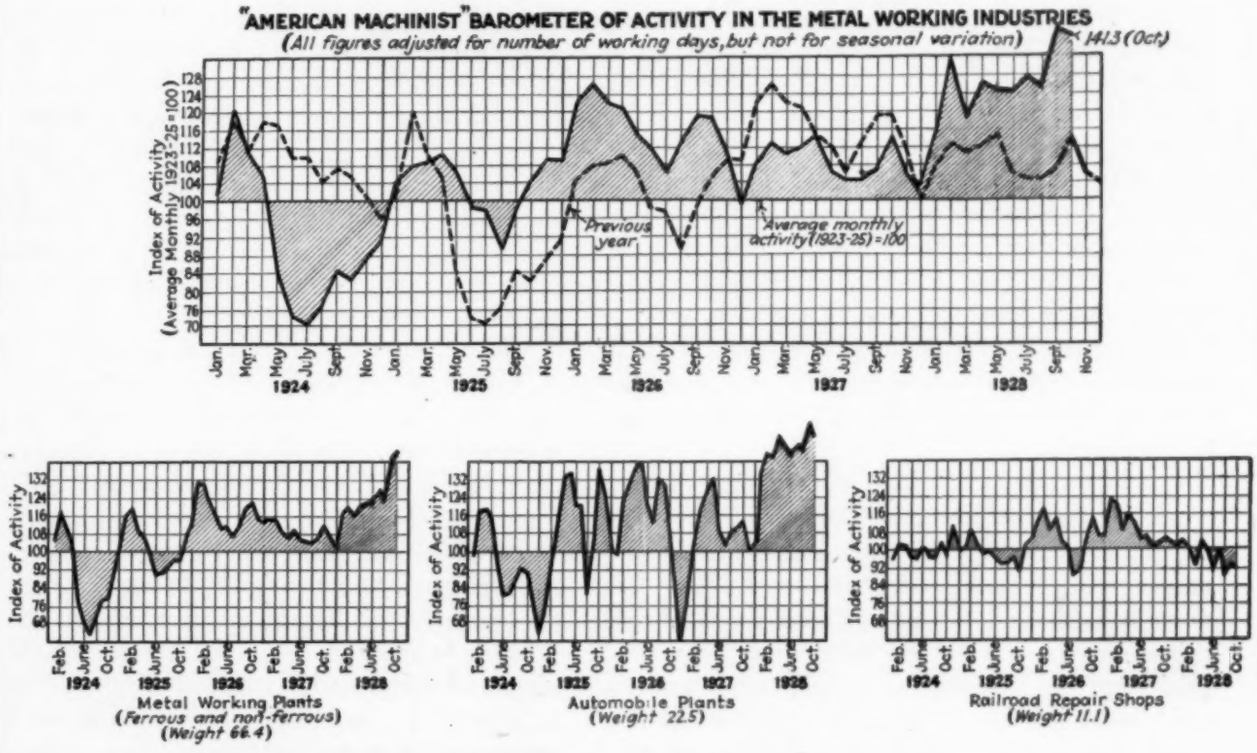
Continued High Operations During October

That the rate of operations in the metal-working plants of the country during October was about the same as during September, is indicated by preliminary data on the consumption of electrical energy by a large number of these plants. The upward trend in operations, which started in April, appears to have reached its peak in September, when a rate of operations 36 per cent above the low point reported in December, 1927 was recorded. The October rate of activity was 0.5 per cent under that for September, but was 27.6 per cent above the rate for October of last year. The average rate of operations for the first 10 months of the current year was 18 per cent greater than that for the same period in 1927. There seems to be every indication that the year 1928, as a whole, will have an average rate of operations from 18 to 20 per cent greater than last year.

The ferrous and non-ferrous metal-working plants reported October activity about 0.7 per cent over September, and 32 per cent over October last year. These plants have been reporting a rate of activity over that for the same month last year, since January. All branches of the automobile manufacturing industry appear to be operating at near record rates, although the preliminary figures for October would seem to indicate a downward turn from the record figure of September. October operations in these plants, however, were still about 35 per cent above October last year. Past history would indicate that these plants will gradually reduce their production operations until the opening of the new year.



A sharp, but probably seasonal decline in the exports of industrial machinery took place during the month of September. The total volume of the first nine months of 1928 was $151,804,000 as compared with $136,101,000 for the same period of 1927. The outstanding feature during this nine months period has been the growth in shipments of construction and metal-working machinery, the former increasing from eight and a quarter million dollars to nearly eleven million, and the latter from seventeen and a quarter to twenty-three and one half million. Engine-lathe shipments increased from $2,222,000 to $3,385,000.



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Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Politics Aside

THE election of Herbert Hoover to the office of President of the United States of America can fairly be attributed to a belief on the part of the voters that it is wise to put at the head of so vast a business machine as our government has become a man eminently fitted by training and experience to meet the problems inseparable from such an enterprise. In view of the wide rifts in the lines of both major parties, and the breaking of the solid South, it is also reasonable to believe that politics played a less important role in this campaign than in any that have gone before. Certainly, the distinctions between the things for which the major parties stand today are so fine as to be almost invisible.

So long as Mr. Hoover was not a candidate for office he was looked to by most of us, whenever a national emergency arose, as the one man in the country best able to handle it. In the heat of one of the keenest political campaigns ever waged, partisan attacks have been made on his record and on his character by the same agencies that formerly hailed him. But, politics aside, he is still the same man he was before, and he will have the same capabilities when he takes office on the fourth of March.

As to the campaign itself it was distinguished by a popular interest wholly unique. The great increase in registration is an evidence of that fact and a large part of the reason for it must be credited to radio, which put the candidates in close touch with the great majority of the electorate.

The smouldering spirit of intolerance that flamed up during the campaign is the most disquieting feature that appeared. It set the nation back many years.

On the other hand, this campaign had no appreciable effect on business. And that is certainly a gain. The general sentiment after former campaigns was, "Thank God, that's over. Let's get down to business." Most of us are thankful that this campaign is over and politics can be shoved aside, but we can hardly get down to business much more assiduously than we have been getting right along.

The American Standards Association

AFTER months of argument the American Engineering Standards Committee has ceased to be and the American Standards Association has taken its place. Although the change is largely one of name there is reason to believe that the functioning of this central clearing house for standards will be improved. Short cuts have been provided for use when customary procedure becomes too involved and long drawn out. And, most important of all, a plan has been worked out to provide for financial support, something the old committee always lacked.

The new organization, like its predecessor, has no power to originate standards. Its function is to review the standards proposed by those familiar with the needs of each particular case and to approve the ones that deserve it. Likewise, it has no power to put the standards into effect, a circumstance that may, or may not, be a detriment.

In the past, the most serious weakness of the old committee was the almost total lack of machinery to get industry to accept its approved standards. It is to be hoped that the plan by which industry is to support the work of the new association will lead to an interest in the standards on the part of contributors, as a return for the support they are giving.

Conservative Views on Aviation

BANKS and bankers have the reputation of being conservative, which is probably a valuable characteristic in those who handle our credit facilities. This conservatism adds weight to statements made by bankers concerning new industries, in this case aviation. In a recent article on Commercial Aviation Today, Frederic L. Simmons, of the National Bank of Commerce, cites many interesting features of the development of air transport.

Some of these figures are a bit startling. Forty air lines now operate in this country over 13,000 miles of airways, twenty-three of these lines now carry mail and seven more are to be added in the near future. Over 20,000 pounds of mail and express are now carried daily and more than 30,000 miles are flown every 24 hours, while over 600 air service operators are flying several times the transport mileage given, each day.

With bankers studying the growth of the airplane industry it is time for all who are likely to be affected by its development to acquaint themselves with its status and possibilities.

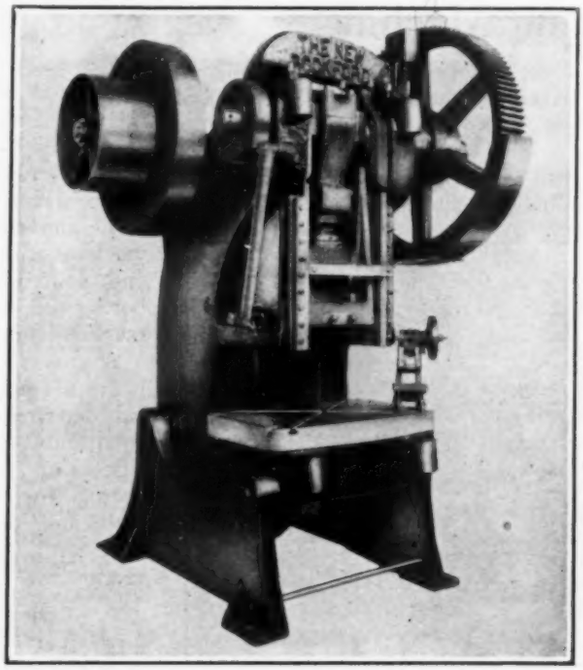
· SHOP · EQUIPMENT · NEWS ·

Rockford Model R Inclinable Presses

EIGHT sizes of inclinable presses, each made in either the flywheel or single-geared types, have been added to the line of power presses manufactured by the Rockford Iron Works, Rockford, Ill. They are termed Model R, and range in size from Nos. 1 to 8 inclusive.

Specifications of the presses are shown in the table. The crankshafts for all models are heavy in design, heat-treated, and operate in bronze-bushed bearings. Design of the crankpin is such that it has twice the area of the crankshaft section, thus increasing the bearing surface and decreasing the pressure per square inch of the projected area. The crankpin bearings also are bronze-bushed. The connection screw is made large in size, heat-treated, and is equipped with adjustable ball-type seats. Anti-friction bearings are used for the backshafts, and an additional bearing is provided at the outside of the pinion. The brackets for the backshaft are made in one unit to prevent misalignment. Clutches of either the jaw or the pin type are furnished. The jaw type, furnished on machines having a crankshaft up to 3½ in. in dia., has three automatic locking pins to prevent rebound and has hardened steel inserts for driving. The pin-type clutch, used on machines having a crankshaft 4 in. or larger in diameter, has a reversible clutch bolt, enabling both ends to be used. Forged steel plates are used in connection with the gear, these plates carrying hardened steel inserts for driving.

Extra long slides and gibs have been applied to increase the bearing surface and to insure longer life to the dies. The brakes are of the band type, arranged to compensate for expansion in continuous operation. Adjustment is made from the floor by hand at the left side of the machine.



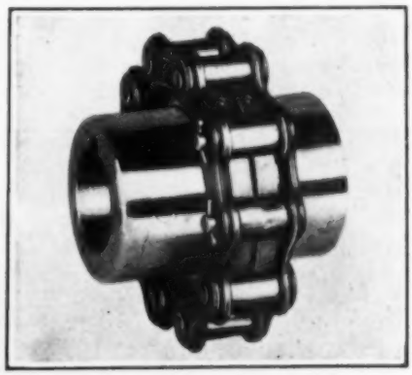
Rockford Model R Inclinable Press

Model of Press	1R	2R	3R	4R	5R	6R	7R	8R
Diameter of crankshaft bearings, in.	1¾	2¼	2¼	3	3½	4	4½	5
Diam. of crankpin, in.	2¾	3½	3¾	4½	5½	6	6¾	7½
Opening through housing, in.	7½	9	10	11	15	16	19	19
Center of slide to back, in.	4½	6½	7	7½	9½	11	12½	14
Size of bolster, in.	9½x16½	12x9	13x22	14x26	18x32	21x34	24x41	27x45
Max. opening in bed, in.	6x8	8x10	9x12	10x15	14x18	16x20	17x22	18x22
Stand. stroke of slide, in.	2	2	2	3	3	3	4	4
Max. stroke of slide, in.	4	5	6	6	7	8	8	10
Strokes per min. (flywheel press)	150	125	115	100	95	90	85	85
Strokes per min. (geared press)	66	60	60	55	50	50	45	45

All models can be operated in either a vertical or inclined position. There are four operating positions on presses Nos. 1 to 6, and three operating positions on Nos. 7 and 8. Adjustment to the desired position is made by two square bolts located at the rear of the bed. Lubrication is by oil or grease, and either plain or automatic as specified.

Clark Flexible Coupling

The Clark flexible coupling, formerly made by the I. H. Dexter Company, Goshen, N. Y., has been acquired by the Diamond Chain and Manufacturing Company, Indianapolis, Ind. The standard type, shown in the illustration, is generally used for constant-torque drives. It may be obtained with either cast-iron or steel sprockets, and is available in bores from ⅝ to 8⅝ in. in steel and 1¼ to 7½ in. in cast iron. The sprockets are held together by means of a flexible chain wrapped around them and held in position by means of a master pin.

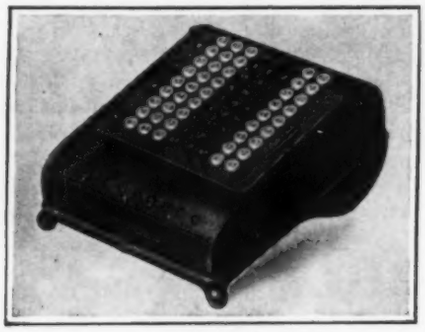


Clark Flexible Coupling

Type "E" coupling is designed for heavier strains than the standard type. The sprockets are of steel and the hubs are of cast iron. The large sprocket type is suitable for pulsating drives.

Burroughs Electric Calculator

An electrically-operated calculator, capable of speed beyond the skill of any human operator, according to the manufacturer, is being introduced by the Burroughs Adding Machine



Burroughs Electric Calculator

Company, Detroit, Mich. The electric operation reduces the physical effort on the part of the operator to a short depression of the keys. The light key touch, which is uniform for all keys, actuates the motor, and the motor completes the operation. This key touch results in greater operating efficiency and greater production per operator.

Positive key action is another feature of this machine. Errors due to incompleted strokes of the keys are impossible as the operator cannot short-stroke or otherwise misoperate a key. The calculator is similar in size and appearance to other Burroughs machines. The small motor is entirely inclosed within the case and operates on a. c. or d. c. It runs only when a key is depressed. A ten-column totaling size is available.

Baker No. 25 H.H. Hydraulic-Feed, Horizontal Boring Machine

BORING operations on such parts as automobile transmission cases and rear axle housings may be performed on the hydraulic-feed, horizontal boring machine of unit type which may be adapted for a wide range in operations. It is built by Baker Brothers, Inc., Toledo, Ohio. Fig. 1 shows a front view of a boring machine equipped with two heads, each head being fitted with two spindles for boring two holes in an automobile transmission case. The machine is complete with a fixture and boring bar support. The essential units are the two end frames, to which are attached the sliding saddle, each operated by an independent Oilgear pump. On these saddles are mounted the necessary heads, and between the frames is mounted a center frame of the necessary length to accommodate the fixture. On this particular job one machine is used for the roughing operation and a second machine used for the finishing operation.

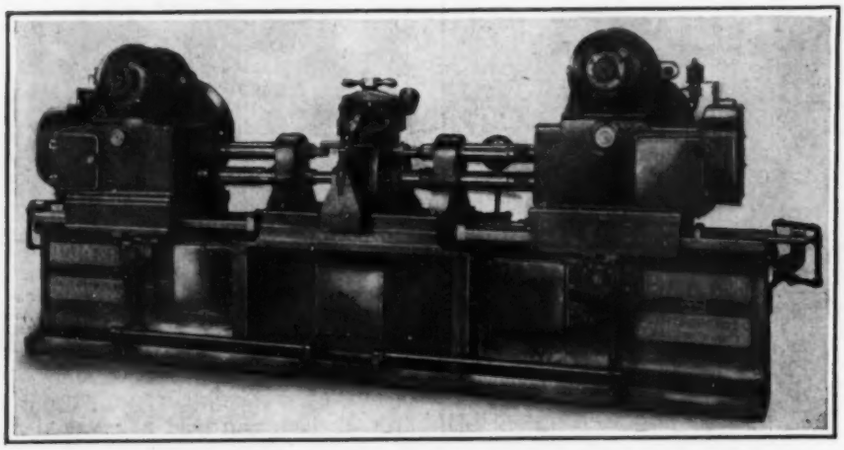


Fig. 1—Front view of a Baker No. 25 H.H. Hydraulic-Feed, Horizontal Boring Machine equipped with two heads with double spindles

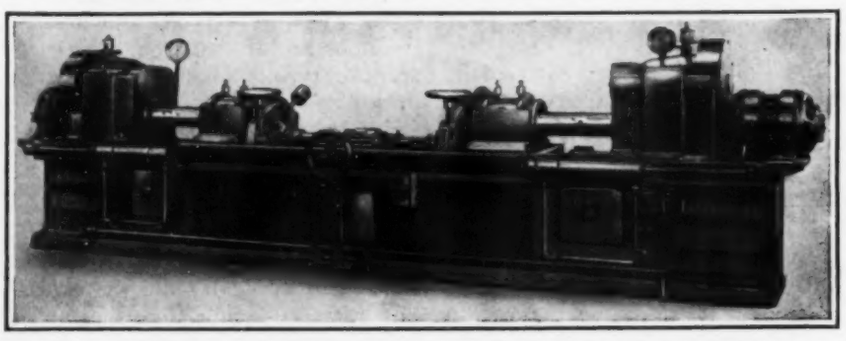


Fig. 2—Single-spindle heads on this Baker No. 25 H.H. Boring Machine are set up for boring truck rear axle housings

The main heads are driven by independent electric motors. The feed is controlled by foot pedal, which is situated conveniently for the operator. By using an Oilgear pump for each end, the piping is much simplified and an equalizing mechanism is not required. The feed has the characteristic advance and automatic quick return of the Oilgear mechanism and provides an infinite number of adjustments of the rate of feed within its scope. The saddles slide on straight ways so proportioned as to secure a maximum of alignment and rigidity. Fig. 2 shows a machine with single spindles at each end, and complete with a fixture for boring and counterboring castings for truck rear axle housings.

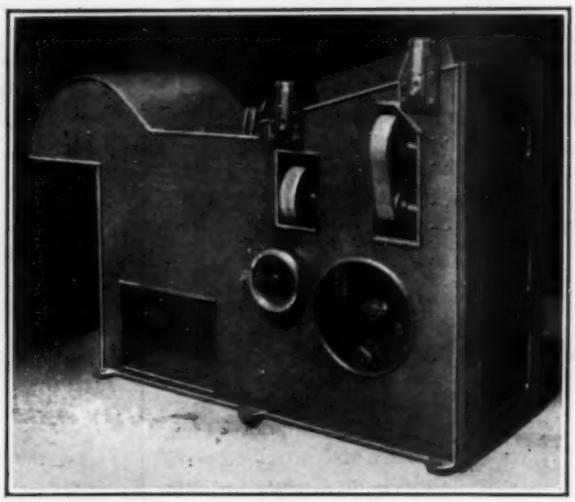
A pressure gage is located on each hydraulic pump so that the operator can determine whether the operating conditions are satisfactory or not. For example, if the pressure is abnormal it would indicate that the tools were dull, that the material was unduly hard, or that the chucking operation was not normal.

McKenzie Screw-Machine Product and Chip Separator

An automatic feeding device and a lower unit construction than heretofore are featured in this improved machine, which is intended for the separation of finished screw-machine parts from the chips after the oil has been extracted. The machine is marketed by the McKenzie Engineering Company, New Rochelle, N. Y., and will separate parts as small as 0.063 in. in diam. by $\frac{3}{16}$ in. long at the rate of about 5,000 pieces per min., according to the manufacturer.

After the operation of removing

the oil, the pan containing the work and chips is emptied into the receiving box of this machine, and then the air draft is regulated by means of a handwheel to suit the size of the parts to be separated. The machine feeds the material into the vibrator, spreads it, and shakes the parts loose, meanwhile blowing the chips into a box or barrel in the rear. The separated parts fall from the air chamber into a box. A bushel of parts per min. can be handled. Other features of this design are the solid frames, the heavy steel vibrator, the steel work pan (self-feeding type), the blast gate in the blower, and the metal air chute base. The backplate interchanges with the motor plate, which takes a 3-hp. motor. Belt drive can be furnished. The dimensions are 5½ ft. x 40 in. x 21 inches.

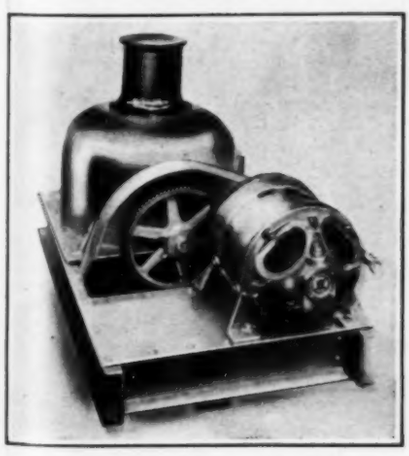


McKenzie Screw-Machine Product and Chip Separator

Stephens-Adamson No. 17-J Car Spotter

A vertical capstan-type car spotter known as No. 17-J, Jr., has been placed on the market by the Stephens-Adamson Manufacturing Company, Aurora, Ill. The machine is intended for pulling industrial cars out of long kilns or for other similar purposes. It is mounted on a rigid steel base made of riveted channel iron, and the motor bracket is mounted on a steel plate riveted to the channels to form part of the base. The bevel reduction gears are inclosed in the machine housing to afford them protection from abrasive substances.

One laborer can easily operate the machine. A rope is hooked onto the railroad car and a couple of turns snubbed around the capstan of the car spotter. The car spotter moves the car at a rate of 30 ft. per min. The capstan has a speed of 15 r.p.m. and exerts a 2,000-lb. pull on the rope. It is driven by a Westinghouse 5-hp. motor. The weight complete is 1,075 pounds.

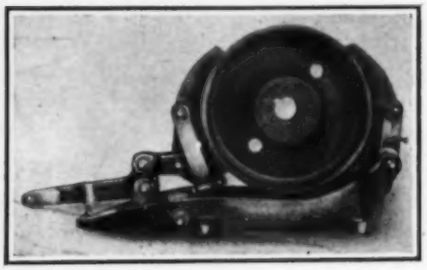


Stephens-Adamson Model 17-J Car Spotter of the vertical-capstan type

E. C. & M. Type WB Mechanically-Operated Brake

A shoe-type brake intended for the bridge drives of electric traveling cranes, lift bridges, electric hoists, and other applications requiring foot-operated or handlever-operated brakes has been placed on the market by the Electric Controller & Manufacturing Company, 2700 East 79th St., Cleveland, Ohio. The brake, which is designed for lever operation, is a modification of the type WB electrically-operated brake, and practically all the wearing parts are interchangeable on the two types.

It is stated by the manufacturer that this brake is designed with increased capacity so as to offset the effect of the use of anti-friction bearings on cranes or other machinery. Cranes equipped with anti-friction bearings drift along with practically undiminished speed when the controller is shut off, with the result that the brakes often will not stop the crane unaided by bearing friction. Because of this tendency Type WB brake is heavily designed and thick molded asbestos brake shoes are featured.

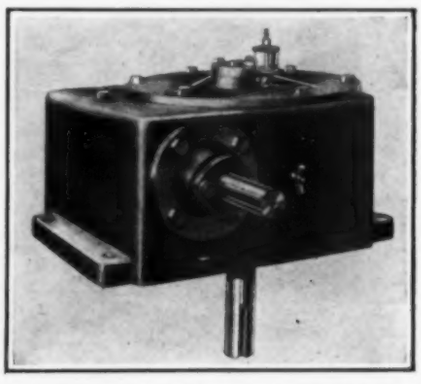


E. C. & M. Type WB Mechanically-Operated Brake

James Vertical-Type, Heavy-Duty, Worm Gear Speed Reducers

Worm gear speed reducers in nine sizes of the vertical type have been placed on the market by the D. O. James Manufacturing Company, 1120 West Monroe St., Chicago, Ill. The smallest and highest ratios of the smallest size are 5.25 and 40.0 to 1, respectively. The limiting ratios for the largest speed reducer are 9.25 and 48 to 1. Not more than twelve standard ratios are available for any size.

The housing of this speed reducer is of gray iron, and is provided with a large oil-cooling chamber. The housing is made to permit the drive shaft to project at either the top or



James Vertical-Type, Heavy-Duty, Worm Gear Speed Reducer

the bottom. Timken bearings support both ends of the gear shaft. The worm shaft is mounted on double Timken bearings on one end and Norma-Hoffman roller bearings on the other. Gear shafts are of 0.40 carbon steel, ground to size. Worms are made integral with the worm shaft which is of S.A.E. 3,140 chrome-nickel steel. They are generated, heat-treated, ground, and fully relieved. The gears are made of phosphor bronze, the larger sizes being made up of a bronze ring shrunk on and keyed to a cast-iron spider. Teeth with 20 to 30-deg. pressure angles are standard, depending on the number.

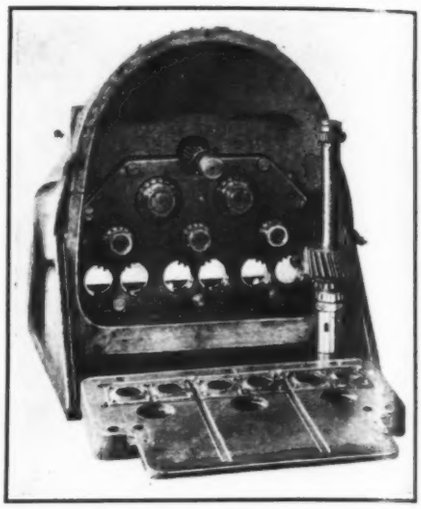


Fig. 3—The separate plate mounting of the Timken bearings makes it possible to change the center-to-center distances of the spindles by simply replacing the steel plates

Putnam Vertical Boring and Drilling Machine

TWO automotive production machines of unusual design have recently been developed by the Shaw Crane-Putnam Machine Co., Inc., a subsidiary of Manning, Maxwell & Moore, Inc., Fitchburg, Mass. In Fig. 1 is shown the vertical cylinder-boring unit, while Fig. 2 shows the valve-hole drilling and reaming machine. Both units are alike in principle of construction, the only variation being in the head design.

Among the outstanding features of these machines is the direct motor drive of the spindles. In each case the motor is mounted on the head close to the tool. Drive is through chrome-vanadium steel helical gearing, all shafts being mounted on Timken roller bearings and provided with flood lubrication from a geared pump. Provision is made so that pick-off gears may be applied, giving a 25 per cent variation in spindle speed both up and down from the normal.

Another feature is the separate plate mounting of the Timken bearings which makes it possible to change the center-to-center distances of the spindles by installing new plates and spindle gears in the head without entailing the expense of an entire new head. In Fig. 3, this construction is indicated. The outer bearing cups are pressed into the steel plate and the inner cones of the Timken bearings are machined directly on the shafts, which are suitably heat-treated.

The use of steel plates and special application of Timken bearings al-

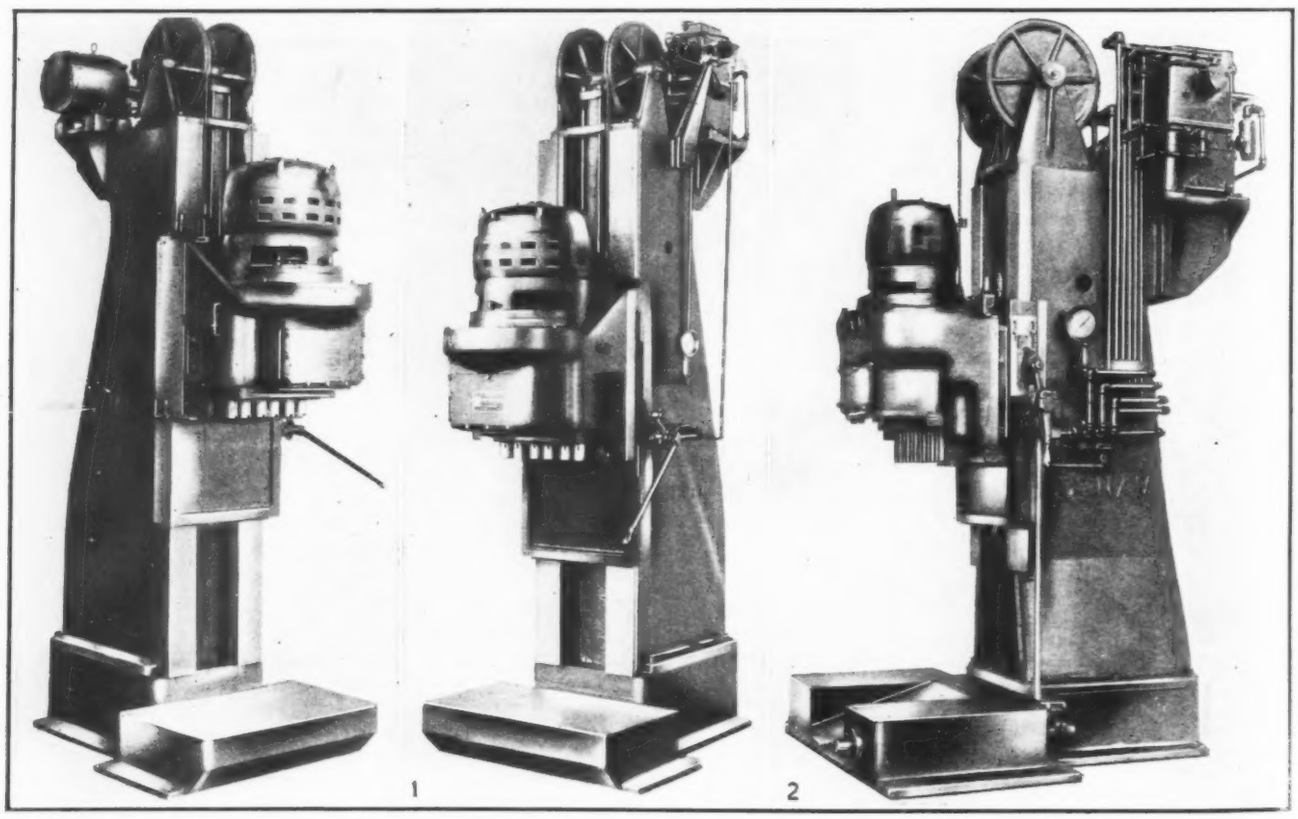


Fig. 1—Putnam Vertical Cylinder-Boring Machine. Fig. 2—Putnam Vertical Valve-Hole Drilling and Reaming Machine

lows space for spindles of unusually large diameter. This permits the greatest possible speed of operation. These spindles are held rigidly, due to the separate plate type of head construction which permits an especially long distance between spindle bearings. The spindles are practically vibrationless, thus producing accurate work.

MACHINES HAVE HYDRAULIC FEED

The saddle has a narrow guide, and accurate alignment is insured by taper gibs, at both top and bottom of the saddle, with square locks. The saddle is over counterbalanced, thus assuring a thrust load against the oil in the feed side of the cylinder at all times. Oilgear hydraulic feed is used on both machines and can be controlled either automatically or manually. When controlled automatically, the head rapidly traverses down until it comes to the cutting point on the work. It then automatically goes into the feed and continues until the work has been machined, then rapid traverses back until it reaches the starting point, where it stops. The operator then changes the work and pulls a lever which repeats the cycle. The Oilgear hydraulic feed pump with its driving motor is mounted on a bracket on top of the column and thus a minimum of floor space is occupied by the machine. A 3-hp. motor is recommended for the pump drive.

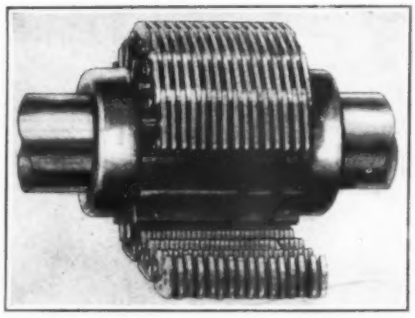
The table and base, in the case of either machine, is an integral casting. The upright is bolted to the base and is fitted with a key and dowels, thereby insuring rigid construction. The work table can be made to suit particular requirements as to the size and height above the floor.

The cylinder-boring machine can be made to accommodate 4, 6, or 8 spindles. The vertical capacity can be made to suit requirements. In the machine shown in Fig. 1 the center line of the spindle is 14½ in. from the face of the column, and the distance between the spindle ends and the top of the work table can be varied from 31 to 79 in. A work table 48x25 in. is provided, and is located 12½ in. above the floor. A 20-hp. constant-speed motor with push-button control is recommended for the drive.

The valve-hole drilling and reaming machine shown in Fig. 2 can be made to accommodate 6, 8, or 16 spindles and the vertical capacity, as in the case of the cylinder-boring machine, can be made to suit the requirements. In the particular machine shown, the distance from the face of the column to the center line of the spindle is 13 in. and the distance between the top of the work table and the end of the spindle can be varied from 32 to 58 in. The work table measures 56x27 in. and is located 10½ in. above the floor. For this machine a 5-hp. constant-speed motor with push-button control is recommended.

Morse Flexible Coupling

Two sprockets and a piece of chain wrapped about them are the essential elements of the flexible coupling manufactured by the Morse Chain Company, Ithaca, N. Y. As shown in the illustration, each half of the

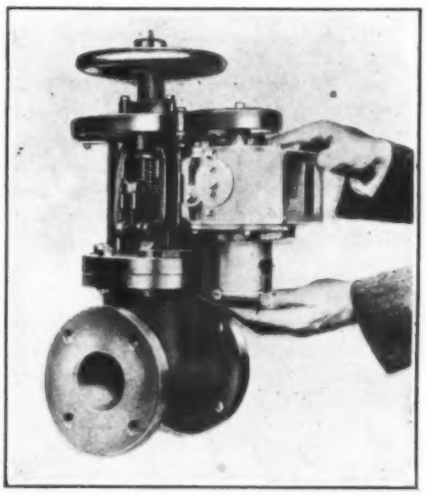


Morse Flexible Coupling

chain is taken by a sprocket, one of which has a guide groove in the center of the face to hold the chain in place. The other, having no groove, is free to float under the chain. The chain fits loosely enough on the sprockets to take care of ordinary misalignment.

Cutler-Hammer Motor-Driven Mechanism for Operating Valves

Valves up to 6 in. in diam. can be operated automatically by means of this motor-driven mechanism which has been developed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Although the device is so small that it can be held in one hand, it has a rating of 15 ft.-lb. It can be operated from either float switches, temperature-controlling devices, pressure regulators, or by conveniently located push buttons. While

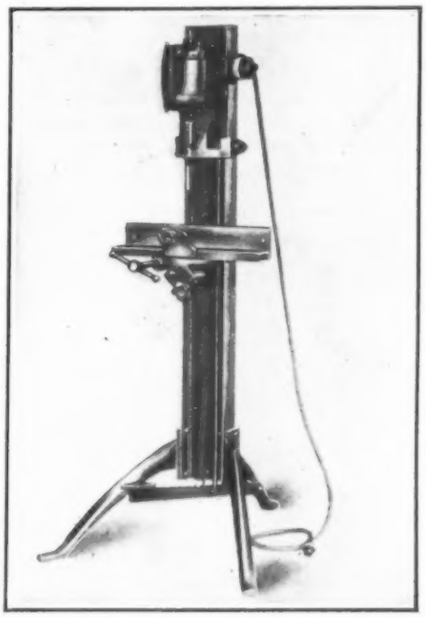


Cutler-Hammer Motor-Driven Mechanism for Operating Valves

designed primarily for valve service, where regulation of pressures and temperatures of gases and fluids is necessary, it is also adaptable to many miscellaneous applications.

DeWalt Improved Mortiser

Chisels up to ½ or ⅝ in. for soft wood can be accommodated in this mortiser which has been placed on the market by the DeWalt Products Company, Leola, Lancaster County, Pa. Material up to 14 in. can be handled, and the stroke and depth of the cut can be adjusted easily. All



DeWalt Improved Mortiser

moving parts are adjustable for wear, thereby maintaining accuracy.

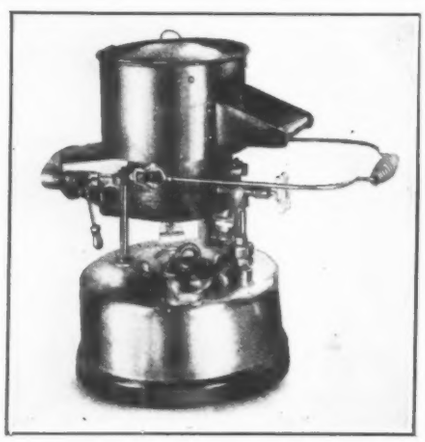
The simplicity of the design permits easy operation. The table is operated by a handwheel, slides 12 in., and has in and out adjustment. The table is 20 in. in length overall and tilts to any angle, right or left. It is provided with scale and indicator to show the degree of tilt. The chisel stroke is $5\frac{3}{4}$ inches.

The motor carriage is a combination roller and slide head with compensation for wear by means of four eccentric roller shafts. It is carried on a steel channel column with machined slide way. The tool is driven by a special ball-bearing, $\frac{1}{2}$-hp. motor of the repulsion-induction type for operation on 110- or 220-volt single-phase a.c. circuits. The weight is 260 lb. net.

Clayton & Lambert No. 70 Firepot

A pair of heavy soldering coppers may be heated and a pot of metal may be melted at the same time on the No. 70 firepot which has been placed on the market by the Clayton & Lambert Manufacturing Company, 6282 Beaubien St., Detroit, Mich. The coppers can be heated from heel to point, the tips being protected from direct flame, and the device can be regulated to hold the coppers and metal at the desired temperature without burning. According to the manufacturer, the firepot starts quickly, and is ready for use in 90 seconds.

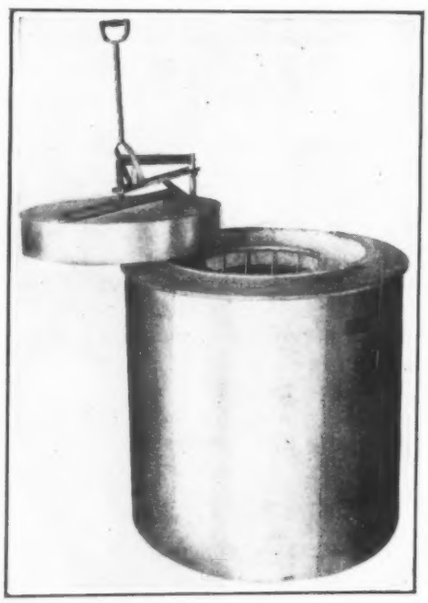
The burner is circular in shape and operates on low-gravity gasoline. It produces a concentrated flame. The firepot is provided with a broad base, and is not top heavy. The vaporizing generator has a cleaner tip to keep the orifice clean at all times, and can be quickly detached for cleaning or replacement. It is claimed that the firepot is noiseless, smokeless and odorless, and hence can be used for inside work. It is not affected by weather conditions, and will operate at full capacity for six hours on a gallon of gasoline. The tank is coated inside and out with tin to prevent rust and leaks. The No. 60 size is designed to melt metal uniformly and takes a 6-in. pot. The weight of the No. 70 is 17 lb. and that of the No. 60 is $15\frac{1}{2}$ pounds.



Clayton & Lambert No. 70 Firepot

Trent Direct-Heat Furnace

Four standard round sizes of a direct-heat furnace have been placed on the market by the Harold E. Trent Company, 439 North 12th St., Philadelphia, Pa. These furnaces are similar in construction to the pot type described on page 35, Vol. 69, of the *American Machinist*. The heating elements are supported in the same way as in the pot-type furnace, the difference in structure being that a high-temperature-proof, alloy-steel guard is provided to protect the heating element and the insulation against damage when loading and unloading the furnace while in operation. Also, in some cases the structure of the cover has been changed. The one shown in the illustration is lifted from the sand seal and swung to one side.



Trent Direct-Heat Furnace

The chief feature of these direct-heat furnaces is the fact that they can be put on the power line without transformers, and can be used on 220- and 440-volt a.c. circuits, either two- or three-phase. Safety fuses are provided with the furnaces. They interlock into the automatic control system and function only in the event that the system should fail to operate, thus preventing destruction of the heating element. In addition to the round type, rectangular or oval shape pit-type furnaces varying from 24 to 84 in. in length have been built.

Trade Catalogs

CENTRIFUGAL OIL-PURIFYING SYSTEMS. The De Laval Separator Co., 165 Broadway, New York, N. Y., has published Bulletin No. 101, entitled, "The De Laval Method of Reclaiming and Purifying Cutting Oil." Three types of separating machines are described, two of which are primarily sediment-eliminating machines, while the third is designed to handle liquid containing sediment and water. Complete descriptions and photographs of all purifiers, multiple clarifiers and center-slung extractors make up the bulk of the catalog. Specifications of all three types are given.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has published three catalogs on motors and controlling devices. Bulletin 61B covers constant-speed d.c. motors of Type CD in sizes from 3 to 200 hp. Catalog 844A shows Type CR7009-B12 across-the-line magnetic reversing switches for single-, two-, and three-phase motors. Catalog 1059 shows two-frame and four-frame motor drives for roving, spinning, and twisting frames for Type KT motors of from 5 to 40 hp. Control apparatus for these frames is also described.

"HOCUT" METAL-CUTTING COOLANT. E. F. Houghton & Co., Third, American, and Somerset Sts., Philadelphia, Pa., has prepared a catalog on the transparent water-soluble metal-cutting coolant known as "Hocut." The physical properties, the wetting action, advantages and uses, and instructions for mixing are given. Its uses on automatic machines for drilling, milling, reaming and grinding operations and brass drawing and sawing are described.

NEWS OF THE WEEK

French Industry Faces Labor Shortage and Rising Costs

Mass production appears to be the obvious solution

By Our Paris Correspondent

THE metal-working trades in general, and that of most forms of machine production as well, claim to be hampered by a lack of an adequate labor supply. Labor has perhaps reached its limit of availability which suggests that the natural step forward is in the improvement of machinery and handling equipment.

Labor is moreover on the eve of demanding — and probably getting — a higher wage. This will do little towards reducing production costs when the sellers' market which is hoped for really comes into being. Foreign, unskilled labor as a palliative will do little to help the situation as the Workers' Confederation demands that all labor shall be paid alike for the same work accomplished.

Signs are visible that recognition is coming, if but slowly, that French industry can reduce production costs by a unified production activity on the base of a horizontal trust, or cartel. Just recently five French automobile firms have laid the foundations of such a working plan.

Throughout France labor is lacking. The government agencies recently reported in one week 17,335 demands for labor as unsatisfied. The metal trades bureau alone reported 2,148 offers of work which found but 210 takers. Most automobile plants in the Paris district are advertising in the daily press for specialists in all crafts. The greatest need is in the Paris and Lyons districts. Foreign laborers came into the country this last week to the number of 3,650, placed chiefly in mines, metallurgical and metal-working industries.

Workers' living costs are, with one exception (October 1, 1926) at the highest index figure ever known, averaging 519 with food costs (60 per cent of the total) at 536. At the close of the war the general index stood at 238, with food at 260.

The workers, basing their demands on these index figures, are obviously justified in claiming a wage increase as wages *per se* have risen in nothing like these proportions. Manufacturers will perforce pass any increase in production costs on to the consumer, or meet it, if they are wise, by the installation of further efficient machine equipment.

What may prove to be the possible forerunner of other similar accords in the metal-manufacturing industries is that just consummated at Lyons, the second big group of decentralized mechanical industries in France. An agreement was arrived at between the Syndical Chamber of Allied Metal Industries and the General Syndicate of Metal Workers imposing a new wage scale which was to be adhered to by both parties henceforth.

The chief items of the wage schedule are as follows:

	Fcs. per Hour
Professional qualified (specialist) workers	6.00
Professional workers, first category (of guaranteed capacity output)	5.25
Machine workers, non-specialist	4.50
Laborers (unskilled)	3.50

These figures imply a gain of 10 per cent of the wage in force last July. At that the skilled worker earns rather less than $2 a day, scaling down to $1.10 for those of the last category.

The recently closed automobile show indicates that French makers are directing their efforts along lines pointed out to them by the American industry. Obviously this was not to be longer ignored as 23 different American makes of cars—a larger number than ever before—were displayed in competition with the dominant numbers of French productions on show. There were but 5 British cars shown, by the way.

Monsieur Citroen recently made a statement to an American investigator that he expected to turn out 75,000 four-cylinder cars and 75,000 six-cylinder cars this year. Renault, of course, is second in line. The new Rosengart 5-hp. car is planned for 25,000 production. All these plants are operating on the American formula—more or less—and their success is a result thereof.

With the stimulus that such efforts will give other smaller makers, it is obvious that there will be an increasing demand by this industry—the chief here as it is in America for the absorption of high-production machines—for equipment on a scale hitherto unknown.

The Federation Metallurgique Francaise, under the presidency of Gaston Japy, senator from the Doubs department, and himself at the head of an important metal-transforming industry, has discussed the desirability of an emphatic understanding between producers of semi-raw materials and the transforming industries on the basis of a rapprochement of outstanding interests.

The International Machine Wire cartel is advocating an eventual rise in prices, a matter which will be decided at its Paris meeting before the end of the year.

Manufacturers of machinery, tools, and transmission appliances find the present situation normal, but admit the necessity of publicity for technical improvements among manufacturers of consumer goods.

Woodworking machinery is suffering, as it has for some years, from a slowing down in the building and furniture trades, but is now reported as being on the road to improvement.

Small metal-working tools are reported active, but manufacturers protest that the sale is so divided among a multiplicity of small dealers that the jobbers profit more than the manufacturers who are loath to tie up capital in warehouse stocks.

Manufacturers of agricultural machinery are feeling the effects of backward production methods before the price demand of the consuming public. It is admittedly only possible to improve this state of affairs by extreme specialization and super-production methods, something almost unknown in this industry here. The trade syndicate of manufacturers is at last taking steps toward standardizing accessories and elements of their product and, of course, on a metric basis. This, it must be admitted, puts American machines of a like nature at a disadvantage.

Price Increases

The French foundry industry, as a result of the rise of 25 francs a ton on semi-raw materials, have in many instances raised their prices in a like proportion. Malleable producers are considering similar action. This will certainly affect the now vigorous revival in automobile plants, either to the extent of cutting profits or raising the price on the finished product. Foundry methods in France, it should be stated, are undergoing a process of improvement by the introduction of mechanical appliances in place of hand labor to a greater extent than ever.

Right here it is noted that Krupp's, through its Paris headquarters, is pushing the sale of machine and automobile parts made to specification on the basis of price competition and apparently getting business. If "assembly" comes

to be a prominent phase of French industry, "manufacturing" processes, requiring modern tool equipment in place of less capable machines which might be scrapped, will suffer a setback.

In general the metal-transforming industries are feeling the effects of the rise in the cost of semi-raw materials which somewhat discounts the seeming prosperity in many special lines. The question may well be asked as to whether franc stabilization has really stabilized business. The prospective rise in the wage scale is another element which has to be reckoned with as affecting costs.

Import and export figures are again at variance in proportions which show France at a disadvantage. During the past nine months there has been an increase in imports of "manufactured articles" of 1,388,156,000 francs, as against a falling off of exports in the same classification of 600,073,000 francs, which reduced to dollar values shows a red ink balance on these items of rather more than $400,000,000.

Seven months' import of "machinery, tools and other metal fabrications" showed an increase of 22,000,000 francs in value and a falling off in exports of 10,000,000 francs.

General imports and exports of the present year to date have varied monthly within comparatively close limits, the lowest values having been recorded just before the stabilization of the franc. An improvement is to be noted since, but a total deficit of exports, as compared with the same period in 1927, still persists.

Car loadings still show increases over the same weeks of last year. The highest figure of the present year was in the last week of September, an increase of 17 per cent.

Swiss Metal-Working Industry Passing Through a Mild Crisis

Competition affected by cheap money of neighboring states

APART from various smaller enterprises working under relatively normal conditions by reason of the demand for their more or less stable product, manufacturing plants in Switzerland have been passing through what is considered a mild crisis in the past few months. In certain closely-related, metal-working industries, there have been reported 7,000 employees who were protesting that their working hours had been cut to far less than the normal 48 hours a week, and that during the last three months, to remedy this situation, numbers of workers were discharged, a radical measure which the trade unionists immediately frowned upon, but with no visible avail.

Industrial Situation

Switzerland is essentially an industrial country, and those employed in general productive lines number considerably more than those engaged in agricultural pursuits. The metal-working industries alone give employment to well above 150,000 persons, virtually a twentieth of the population. Switzerland's metal manufactures run pretty much the whole gamut of products from steel pens to steam and electric locomotives. Raw materials and combustibles, to say nothing of food stuffs to a very large proportion, come almost entirely from abroad. Hydro-electric power is the chief of indigenous natural resources.

Omitting all reference to the malaise resulting from the war and carrying over into the after war years, Switzerland later began to benefit from a quasi-prosperity though this was largely due to the famous invisible exports represented by tourist expenditures which, since the establishment of the League of Nations at Geneva, have certainly been no less than in the palmiest years of before the war.

It is believed that any manufacturing crisis which has developed or may develop in the Swiss metal-manufacturing trades is the result of the changing values of export markets and a reflex of the low value of the monetary units in France, Italy and Belgium, which countries, by reason of cheap money, have been pouring their excess product into world markets at prices with which Switzerland could not compete. It is recognized that with a restricted home market Switzerland is bound to go more or less afield for its big production market, but it is precisely on these often non-specialized articles, as for instance electric meters, automobile accessories, and many small electrical appliances, that world competition has to be met, essentially with regard to price though Swiss manufacturers have never been classed as inordinately high priced.

It is claimed that unless the foreign market situation improves by the increase of buying power and the lowering of tariff barriers, Swiss industry is bound to curtail its activities and that thousands of industrial workers will perforce find themselves without employment.

French Competition

The more important metal-manufacturing industries especially complain of the competition of France in markets that before the war at least divided a fair share of business on behalf of Swiss industries. In addition, within the past few years, Switzerland, as other European manufacturing countries, has found German competition an almost insurmountable barrier in many lines where the article demanded is of the current type, being handicapped by price as by the extended credits which German manufacturers appear to be fostering throughout world markets. If Swiss banks are actually gorged with money, as is often claimed, it should not be ignored that this money is largely that of foreign depositors who have put their cash in the coffers of always-neutral Switzerland as a measure of safety. Beyond certain limits Swiss banking laws do not allow these deposit funds to be loaned out to industry except on exceedingly short-term operations.

Certain small tools and other objects of metal are being quoted in markets where Switzerland at least had formerly a fair share of business at figures said to be 30 per cent under Swiss production costs. Even the famous Swiss files are said to be thus affected.

Electrical Equipment Active

The big electrical machine plants profess to have a normal business in hand and in view, regretting at the same time that manufacturing costs are as high as they are and that selling figures are as low as they are. Being commodities of a respectable valuation, the operations once consummated do carry a profit of importance to the ledger account but not in the proportions hitherto known and believed to be necessary for carrying on a prosperous affair. The above refers to machinery of imposing proportions for installation by public enterprises and the like, but when it comes to those of smaller dimensions the situation is not so satisfactory.

The machinery and machine tool industry is in an even less satisfactory state, feeling the effects of a possible hovering crisis and with few orders in hand may be said to be carrying on from day to day.

There is a large production of textile machinery in Switzerland and this has followed a variable course for some years with moments of encouraging prosperity and again a species of acute stagnation. There are 3,000 or more workers in this industry who are only working two or three days a week.

The automobile industry is not of any great proportions to begin with, but with the recent revival of the Martini, built by the old and famous firm of the name, Switzerland has once more put her name on the automobile map. There are two or three motor cycles and a small car also to the credit of Switzerland and favorably received and known. It is believed, however, that with the multiplicity of American cars circulating in Switzerland that the Swiss industry of itself will never arrive at a great volume of prosperity until what are considered the very modest custom tariffs on such are revised, which of course means upward.

Census of Industrial Purchases to Be Made in Cleveland

The Department of Commerce has arranged to make a trial census of industrial purchases made in Cleveland: that is, the purchase by manufacturers of raw and semi-finished materials, supplies, and equipment. A census of these primary stages of distribution was felt necessary to supplement the sample cen-

sus of wholesale and retail distribution made some time ago in eleven cities. The object of each of these censuses is to provide an idea of valuable information to be sought and how to prepare schedules to obtain such information in a national census of distribution. Cleveland was decided upon because of the co-operation offered by the Cleveland Chamber of Commerce, as well as the evident suitability of the city's manufacturing situation. Cleveland had in 1925, according to the census of manufactures for that year, 2,212 factories among which 91 different classifications of industry were found, doing at least $100,000 business annually.

Production of Electrical Goods High

New orders booked during the third quarter of 1928, as reported to the Department of Commerce by eighty-six manufacturers of electrical goods, were $264,419,328, as compared with $244,467,209, for the second quarter of 1928 and $235,847,857 for the third quarter of 1927.

Full- and Part-Time Plant Operation Studied

A chart recently prepared by the Industrial Conference Board, of New York, shows for representative plants in all industries the percentage of those operating full time and those operating part time since 1923. The chart shows a considerable spread between potential and actual plant operation.

The closing down of the plant for a part of each week is one method by which production can be adjusted to a slackened demand. It is a phase of under-employment which not infrequently accompanies unemployment and industrial depression. In the main, therefore, changes in the proportion of plants operating on part time will reflect changes in the activity of the general business situation. But not all part-time operation is to be ascribed to adverse economic conditions. Some of it has its basis in the day to day necessities of technical production.

Nor is the percentage of plants operating on part time a complete indication of the slackening in production which results from it. Obviously, a three-day week would mean a greater curtailment of output than a five-day week. Throughout this period, part-time operation has in fact meant, as a rule, more than three-quarter operation for establishments operating on part time and over nine-tenths operation for all factories.

Four Leading German Lathe Builders Contemplate Unique Combine

Effort directed to reduce number of stock sizes

By Our Berlin Correspondent

FOUR leading German high-speed lathe manufacturers are contemplating a combine of a singular kind, which if carried out, of which there is little doubt, will probably lead in a new era of concentration in German machine tool building.

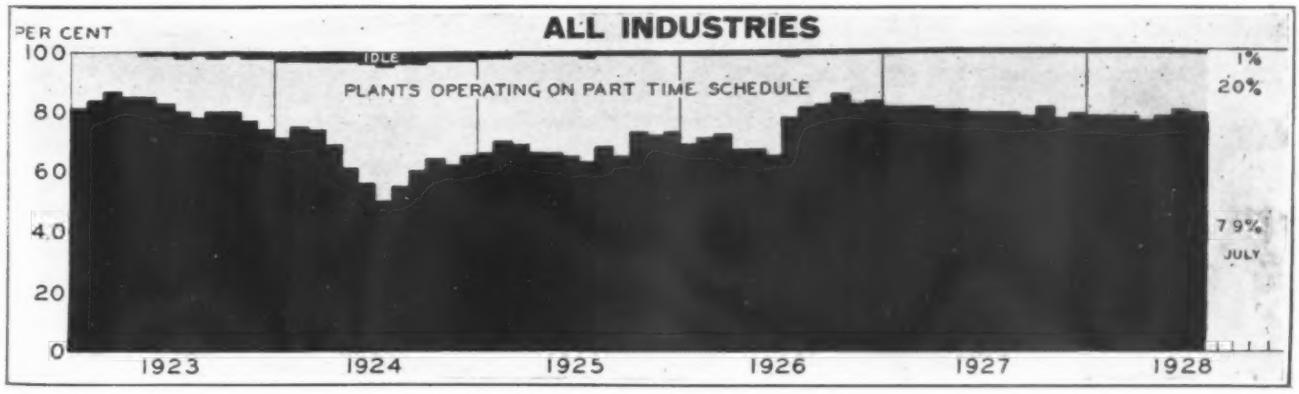
The ruling practice, in conjunction with the more and more specialized wants of users have proved very irksome to tool builders, compelling them to carry a wide range of sizes, and types. A large stock of patterns and of castings is required and lathe builders find it quite impossible to keep a ready stock even of the most customary sizes only. The ever growing capital investment involved thereby seems at last to have overcome the spirit of independence and of competition, strongly inherent in German manufacturers and smoothed the way to a drastic remedy.

It is intended that henceforth the range of sizes shall be divided in four sections, each of which will be taken care of by one individual manufacturer to the exclusion of the others. If an enquiry or order comes in at one of the participants in the understanding, not competent for the size in question, it will automatically be remitted to the proper source of supply. Each of the four manufacturers will thus be able to reduce his stock of patterns, of castings and parts, to build in larger quantities and to give better service to customers by carrying a sufficient stock of tools, ready for shipment. As a not unimportant side issue, an understanding will also be achieved in the matter of prices, doing away with the sometimes quite ruinous price cutting practice.

The idea of the understanding was probably born in the lathe committee of the German Society of Machine Tool Builders, but it could naturally comprise only firms of equal standing and similar quality of the product. It is only a modest beginning in a movement of concentration, but first steps, once taken, carry rather far in Germany. Nowhere, probably, is the set example so infectious as in Germany. Besides the advantages of the new project are obvious: times, with constantly growing wages and overhead expenses are hard, necessity is pressing and "efficiency" in all its aspects and ramifications is the watchword of the day. Once the scheme comes into force it can be expected to be duplicated soon.

Mutual Recognition of Parity Necessary

The mutual recognition of parity is naturally the all-important condition of such an understanding. Fortunately the German mentality in this respect has broadened a good deal. The number of German machine tool builders is still too large for the marketing possibilities and the lines carried by most of them are decidedly yet too numerous, although many radical cuts have already been made. The owners of small and middle-sized shops are just as eager to keep abreast of the "efficiency movement" as their bigger brethren, but they do not know where to begin, the methods employed by the large manufacturers forbidding themselves to them in most cases. Understandings like that contemplated by the four lathe builders are no doubt the quickest, easiest and least expensive method of achieving greater economy combined with greater efficiency.



Full- and Part-time operation of industrial plants

S.A.E. Aero Meeting Program Announced

During the International Aircraft Exposition in Chicago, the aeronautic engineering meeting of the Society of Automotive Engineers will be held at the Hotel Stevens, December 5 and 6, in co-operation with the Aeronautical Chamber of Commerce. Glenn L. Martin is chairman of the meeting committee.

Some of the papers to be presented at the meeting are as follows:

Diesel Engines for Aircraft, L. M. WOOLSON, Packard Motor Car Co.

Maintenance of Air-Cooled Engines in Commercial Operation, L. S. ROBBS, Pratt & Whitney Aircraft Co. and EDWARD HUBBARD, Boeing Air Transport Co.

Airplane Propellers and Gearing, LT. C. H. HAVILL, Bureau of Aeronautics.

Non-Radial Air-Cooled Engines, S. D. HERON, Air Service, Wright Field.

General Principle of Shock-Absorbers, J. F. WALLACE, Cleveland Pneumatic Tool Co.

Relation of Production Costs to Quantity Produced, L. S. MILBURN, Glenn Martin Co.

A Critique of Airplanes, E. P. LOTT, National Air Transport, Inc.

Lighter-than-air Aircraft Developments, KRAL ARNSTEIN, Goodyear Zeppelin Corporation.

There will be a joint meeting of the aeronautics standards division and the commercial manufacturers' section of the Aeronautical Chamber of Commerce on aeronautical standardization, followed by reports of the subdivisions of the S.A.E. standards division on December 6. Other papers deal with flying problems.

Business Profits Rise in First Nine Months

During the first half of the year, the general average of business profits was apparently slightly higher than in the first half of 1927, notwithstanding the comparatively slow business in many lines during the period and the heavy inventory losses sustained by the rubber companies in the second quarter. With the continued improvement in business during the summer, as against the downtrend a year ago, the curve of profits has turned sharply upward and the indications are that the finals for the year will not only exceed those of last year by a wide margin, but will closely approach, if not exceed, those of 1926, heretofore the record year. These facts were brought out by the National City Bank of New York in a recent survey. It was also indicated that in some lines record-breaking output was not productive of prosperity, but rather of overburdened markets and loss of profits.

Profits of industrial and trading companies for the nine months' period increased 18.3 per cent over a year ago, and 16 per cent compared with 1926. Nineteen out of twenty-one groups showed earnings ahead of 1927, and eighteen were ahead of 1926 as well.

General Motors Corporation reported earnings totaling $240,535,000 for the nine months, a gain of 24 per cent over the 1927 period and a new high record. United States Steel Corporation made net profits after charges of $77,087,000 which was 4 per cent above 1927 but still 10 per cent below 1926. Eliminating these leading organizations, combined earnings of the remaining 121 manufacturing and trading corporations investigated amount in 1928 to 18 per cent over 1927 and 8.2 per cent over 1926.

Railroad earnings for the Class 1 lines are available only through the first eight months and show a gain of 1.3 per cent over last year although they fall 9.1 per cent below the total realized in 1926. Railroad operations for the last four months should show up even better. Ninety-five leading public utility systems continue their steady expansion in revenues and in the first eight months of the current year had a combined net income of 10.5 per cent higher than last year and 20.2 per cent ahead of the previous year. Growth of the American Telegraph and Telephone System is maintained at a like rate. It is a most reassuring indication on the business situation to note that aggregate profits of over four hundred of the leading American industrial, merchandising, railroad and public utility companies are 10 per cent above 1927, and 7.8 per cent above 1926, the previous record year.

Hardware Exports Increase

Exports of hardware and allied products from the United States for the first nine months of 1928 were valued at $52,982,723—an increase of $5,211,053 over shipments in the same period in 1927, according to the Department of Commerce. Substantial gains were realized in shipments of hand tools, cutlery, abrasives, stoves and furnaces. Increases were also noted in exports of builders' hardware, household utensiles, plumbing fixtures, and safes and vaults. Shipments of lamps and lanterns, chains, and scales and balances declined slightly.

The general trend, however, has been toward a considerable increase in all lines of hardware and allied products. Of particular note is the increase in exports of nearly all classes of hand tools, and in gains in foreign trade in cutlery, especially the increase in exports of safety-razor blades.

Shipments of hand tools to foreign countries from the United States are steadily increasing. Exports of hand tools during the nine months' period ending September 30 were valued at $15,342,390—an increase of $1,277,448 over shipments in the same period in 1927. Particular increases were realized in shipments of fine tools, such as drills and reamers.

Exports of abrasives for the first nine months of 1928 were valued at $6,207,822, representing an increase of $794,914 over the shipments in the corresponding period in 1927. Increases were realized only in shipments of artificial abrasives, particularly in exports of abrasive paper and cloth.

Electrical Manufacturers Hold Fall Meeting

Numerous business meetings of sections and committees of the National Electrical Manufacturers Association characterized a very successful fall meeting of that association held at Briarcliff Lodge, N. Y., from October 29 to November 1. More than 300 manufacturers were present, representing twenty-seven sections of N.E.M.A., and took progressive steps on leading problems affecting the electrical and radio manufacturing industry.

Terms of payment were discussed in an address by Harry T. Bussmann, president of the Bussmann Manufacturing Co., of St. Louis. Mr. Bussmann's report was based on a questionnaire sent out to the entire N.E.M.A. membership of nearly 360 companies, on which an 86 per cent return had been received. Although the returns showed little uniformity, there was a general tendency to eliminate cash discounts. Out of 91 companies in the Apparatus Division, 49 do not allow cash discounts, 15 permit 2 per cent or more, and 33 companies charge interest on over accounts. In the supply manufacturing industry there was no tendency to eliminate the cash discount.

Other addresses at the general session were made by Louis B. F. Raycroft, vice-president of N.E.M.A. in charge of the Radio Division, on "Radio Broadcasting and Television" and by Huntington B. Crouse, president, on "N.E.M.A.'s Position in the Industry." A paper on the subject of adequate tariff for electrical products was read by Thomas Allen, chairman of the N.E.M.A. tariff committee.

New Instrument Makes Possible Analysis of Color

The exact duplication of any color at any time and at any place has been made possible by a new colorimeter developed by Prof. Arthur C. Hardy of the department of physics at Massachusetts Institute of Technology, and described by him at the annual convention of the Optical Society of America, at Washington, on November 1. The new color analyzer, known as a recording spectrophotometer, eliminates human judgment entirely, and automatically measures the color and wave lengths of any substance rapidly and with precision. Not only does it measure color accurately, but it makes a record by which it is possible to match that shade at any time, thus eliminating all possibility of fading of a standard color. Commercial development is being carried on by the General Electric Co., to whom the patent rights have been assigned by Professor Hardy.

Canadian Machinery Set Record in 1927

The output of the Canadian machinery industry reached its highest point in history during 1927, with a production valued at $44,602,000, according to statistics which have been made available by the Dominion government. This volume represents an increase of 16 per cent over the output value of $38,380,000 in 1926, and 10 per cent over the previous record of $40,535,000 established in 1920.

Of the 160 manufacturers of machinery reporting to the Canadian Bureau of Statistics, 116 were located in the province of Ontario, 27 in Quebec, 10 in British Columbia, 4 in Manitoba, 2 in Saskatchewan, and 1 in New Brunswick. These concerns employed a capital of $62,007,000, gave work to an average of 9,947 people to whom the sum of $13,094,000 was paid in salaries and wages, used fuel and electricity worth $710,000 and by manufacturing processes added $29,324,000 to the value of purchased materials. Purchases by these plants of materials to be used in process of manufacture reached a total of $15,278,000.

Pulp and paper mill machinery led all industrial machinery items with an output value of $8,432,000 followed by elevators and parts, $2,608,000, mining and metallurgical machinery, $2,406,000, water wheels and turbines, $1,384,000, metal-working machinery, $1,363,000, laundry machinery, $1,346,000, transmission machinery, $1,118,000, and pumps, $1,102,000. Perhaps the greatest strides were made in the production of hoisting machinery (other than mining), the output increasing from $674,000 to $1,164,000 or nearly 73 per cent.

Marked Industrial Activity in the South

Figures recently compiled covering industrial activities in the sixteen southern states the first three quarters of this year, show that the foundry, machine shop and kindred iron and steel industries have established an unusually good record, the figures being well in excess of those for the corresponding period last year.

In the foundry and machine shop industries alone approximately 75 companies have been incorporated in the South the first nine months this year and approximately 75 construction projects carried out, the cost of which may be conservatively estimated at about $3,000,000. In the iron and steel industries not classed as foundries and machine shops, about twenty companies were incorporated in the sixteen southern states and some 30 construction projects carried out, the total cost of which may be conservatively estimated at about $3,000,000. In the general metal-working field, not classed as above, about ten companies have been incorporated and about ten construction projects carried out entailing a total investment of around $500,000. Thus, in all branches of the industry, about $6,500,000 has been invested in new construction this year.

Davis to Be Inaugurated President of Stevens

On Friday, November 23, Dr. Harvey Nathaniel Davis will be formally inaugurated president of Stevens Institute of Technology at Hoboken, N. J. He assumed the position on September 1, after resigning the professorship of mechanical engineering at the Harvard Engineering School, Cambridge, Mass. Prior to the inauguration ceremonies, a scientific session will be held at which papers will be presented by Prof. John Johnson, director of research, U. S. Steel Corporation, and Robert A. Millikan, president of the California Institute of Technology and discoverer of cosmic rays. Dr. D. S. Jacobus, a past president of the American Society of Mechanical Engineers, will preside. At a dinner at the Hotel Astor, New York, on the previous evening, November 22, Dr. Henry Suzzallo, former president of the University of Washington and a trustee of Stevens and the Carnegie Foundation for the Advancement of Teaching, will preside. W. H. P. Faunce, president of Brown University, will speak. A large number of prominent educators have been invited to the ceremonies.

In addition to the addresses at the inauguration on Friday, other features will include the unveiling of a memorial to the late Alexander Crombie Humphreys, second president of the Institution; the opening of the engineering museum at Stevens; and the inspection and operation of a replica of the John Stevens locomotive, the first locomotive successfully operated in America, and the predecessor of all American locomotives. A full-size working model of it has been built by the Pennsylvania Railroad Co. at the Juniata Shops and will be run on a replica of the original track near the spot where Colonel Stevens first laid a track and experimented with the pioneer locomotive on his Hoboken estate, now included within the Stevens campus.

Soviet Engineers Here to Buy Equipment

A commission of thirteen Soviet engineers engaged on the construction of the new $17,500,000 Dzherzinsky tractor plant at Stalingrad has arrived in the United States for the purpose of purchasing equipment and arranging for engineering co-operation on the construction and layout of the plant. The delegation is headed by Mr. Tsentsipper, chief engineer on the construction work. The Dzherzinsky plant, on which work was recently begun, will have an annual capacity of 20,000 tractors and will be the largest tractor factory in the U.S.S.R., according to Mr. Tsentsipper at the offices of the Amtorg Trading Corporation, New York City.

Tractors are also being produced in the U.S.S.R. in the Tractor Division of the Putilovetz Works in Leningrad, which has been producing 1,500 tractors annually and is being enlarged to an annual capacity of 5,000 tractors. The Dzherzinsky commission will visit a number of American tractor plants and will arrange with a number of firms for special training of Soviet engineers in American production methods.

Committee Formed on Heavy-Duty Anti-Friction Bearings

A sub-committee on heavy-duty anti-friction bearings was recently formed by the American Society of Mechanical Engineers, it has been announced by George T. Snyder, chairman of the Iron and Steel Division. The personnel of this Committee is as follows: Lane Johnson, chief engineer, United Engineering & Foundry Co., Pittsburgh, Pa.; C. H. Hunt, chief engineer, Weirton Steel Co., Weirton, West Va.; R. C. Stiefel, engineer, Ellwood City, Pa.; H. E. Brunner, chief engineer, SKF Industrious, New York, N. Y.; G. C. Farkell, superintendent, Rolling Mills, National Tube Co., Lorain, Ohio; W. Messinger, Hydraulic Tool Works, D. Street, Philadelphia, Pa.; Sidney G. Koon, secretary, associate editor, *Iron Age*, New York.

Evansville to Honor Graham Brothers

November 20 has been set aside as a holiday in Evansville, Ind., in order that the city may pay tribute to the three Graham brothers, automobile manufacturers, in appreciation of the honor their achievements have given that city and the material gain to the city by the establishment of their body-manufacturing plant. The celebration also will mark the opening of the corporation's $1,000,000 body plant.

Automotive Production Breaks Record

Production of cars and trucks during the first ten months this year reached a figure of 4,068,727, surpassing all previous marks for a corresponding period, according to reports submitted at the directors' meeting of the National Automobile Chamber of Commerce on Nov. 1. The report further shows that the previous high mark for the first ten months occurred in the year 1926 when 4,062,110 cars and trucks were turned out. October output was estimated at 397,000 motor vehicles as compared with a total of 434,915 in September and 227,510 in October last year. October was 75 per cent greater than October 1927 and 8 per cent under September this year.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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IT IS generally expected that the Coolidge boom, now re-named the Hoover boom, will continue indefinitely, and that prices will advance until the public becomes sated or the supply of credit is exhausted. Of course, this is a very dangerous assumption, but there is no denying its force as a factor in speculation or its effect in minimizing the influence of the continued expansion in brokers' loans.

According to the report of the Federal Reserve Bank of New York, these loans showed a gain of $72,000,000 for the week ending last Thursday, and it must be admitted that there is nothing in sight that promises to work any substantial reduction in this record-breaking total. There is, in fact, a prospect of a still further increase, as money has been growing easier, and Europe is commencing to send us substantial amounts of gold. Five million dollars of the yellow metal were shipped from London last week, and some estimates of the amount that may be sent here run as high as $75,000,000. Of course, such an addition to our reserves will greatly increase the lending power of the banks, and a somewhat easier money market is now expected for the balance of the year.

The stock market is now becoming such a huge affair that it is impossible to say who is buying or who is selling, or whether any particular significance is to be attached to the operations of any of the many groups or pools that are supposed to be active from day to day. But as a generalization it may be said that optimism is in the ascendant, and that the public seem to be both able and disposed to buy on reactions. Therefore, it is quite possible that much higher prices may be seen, although the hazards of the situation become greater as higher altitudes are attained.

Of the general business situation, and the effect of the election upon it, it is perhaps too early to speak with definiteness, but there is every indication that the optimism which prevails in the stock market is spreading, and that trade will continue to improve until it is checked by higher prices or a cessation of the consumer demand which now appears to be increasing rather than decreasing.

The condition of the steel industry is almost buoyant; prices show an advancing tendency, and most of the mills are fully employed. The automobile production is still at record figures, and the export demand for American cars is said to be gaining.

The consumption of copper is increasing, and prices are again higher. At from 18 to 19 cents rubber appears to be "stabilized with an upward tendency."

The cotton textile industry shows a further improvement. The demand for goods is more active; prices are higher; and cotton futures surprised the trade by advancing instead of declining on a government crop estimate that was larger than the previous guess. Woolen goods are in excellent demand, although the market for raw wool seems somewhat hesitant. Silk is slightly easier, but a fluctuation of one or two cents a pound does not mean much in the case of an article that sells at more than $500 per hundred pounds.

From this brief review it will be seen that wheat, corn and the other cereal staples are about the only major commodities that have failed to reflect the better tone that has pervaded the commercial exchanges since Hoover's election was announced, but a partial explanation is to be found in the large wheat crops that have been produced in Canada and the Argentine, and the competition that the United States will have to face in disposing of its export surplus. Hence, it is possible that Mr. Hoover may find it necessary to call a special session of the new Congress on March 4th, if the old Congress does not vote some adequate measure of farm relief.

But since the election less is heard of the farmer's predicament, and it is quite possible that the anesthesia of our widely advertised prosperity may make our politicians somewhat less sensible of the distress that their agricultural constituents have been suffering. At all events, the present disposition is to assume that everything is lovely, and in the jubilation for which the election is responsible, many questions that are important may be temporarily lost sight of.

For this reason the importance of developments that are unfavorable may be minimized during the next few weeks, while news that is favorable may be sensationally featured and over-emphasized. For this disparity due allowance should be made by those who keep their feet on the ground, but as the great majority prefer to be optimistic, and as American optimism generally means buying something, it is to be expected that the buyers will out-number the sellers at least until the dominant mood changes.

The news from abroad is in the main satisfactory. In France but little importance is attached to Poincaire's resignation, and his leadership as well as his steadying influence seem to be undisturbed.

The British Parliament has reassembled, but no important action is expected of it pending the general election that must be held next year, and on both sides of the Atlantic there appears to be a very deep-seated belief that 1929 will be a year of great prosperity.

WHAT'S DOING IN INDUSTRY

A SLIGHT letup in activity in the machine tool market was noted in several centers reporting in the past week, but in all but one case there is every indication that a renewal of activity will take place at once. Detroit reports business not as brisk as a fortnight ago, attributing this fact to the seasonal decline in automotive activity, which is expected to continue until after January. Employment fell 6,000 during the week. On the other hand, buying by automotive shops is still a factor in many centers, particularly in Indianapolis.

BUYING by the rejuvenated coal industry is the real highlight of the machine tool and machinery trade in Indianapolis, however, and the farm implement industry is expected to be the next big buyer in the near future. In Chicago, where a letup was noted, inquiries indicate a resumption of buying, now that the election is over. The same condition is true of New England, where the chief metal-working activity centers in the aeronautical and automotive accessory business. In Cincinnati a slight hesitation on the part of local buyers was noticed just prior to the election, but outside orders were received by the machine tool plants in the usual volume. In New York, conditions are spotty, but for the first time in several months, some large single orders were placed.

USED equipment is finding the best demand in some time in all sections of the country, specific instances being found in New York, Chicago, Indianapolis and New England.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

Buying in the New England territory during the past week lagged. New orders placed for machine tools and machinery, as reported by representative concerns, apparently were not as prominent. This condition is considered temporary. With the political situation cleared, a return to brisk activity is certain in view of a continued heavy inquiry for equipment from many sources. The balance of November should see the same strong, steady buying that has featured the machinery market for an extended period.

Small machinery at present commands the most interest in this section. The demand for lathes, drills and punch presses is exceptional. Grinding units and special-parts machinery, the latter equipment being a strong factor in the development of the aeronautical industry here, are prominent.

Automotive and aeronautical manufacturers are looking more and more to New England factories for their accessory products. Plants in this line have contracted many months in advance and are pushed to the limit to meet scheduled requirements. Some dealers in used machinery find their market more spotty. The demand in this field from all sources, however, is better than seasonal. Conditions in all lines of business, with but few exceptions, are reported to be good. Inquiry for new machinery holds strong. The New Departure company, Bristol, plans an addition to its machine shop on Franklin Street. Conveying machinery is selling well in the New England area.

DETROIT

Conditions in Detroit are not as good as obtained two weeks ago and present indications show no hope for any immediate pick up. The noticeable falling off in business is attributed by the trade to be due to the seasonal let down that usually prevails every fall. The principal cause for this condition is the slack period now being felt by the automotive industry as is usual at this time of year. Further slowing up will continue, it is expected, until after the holidays, with little hope of improvement until about February.

Because of the above condition, employment has dropped off more than 6,000 during the past week, and it is highly probable that this trend will continue. No cause for alarm is yet apparent as employment is still 15,000 above previous high levels for this time of the year.

CANADA

Unusual activity in building and continued heavy buying of railway equipment and rolling stock, are outstanding features of the metal working situation in Canada. Structural steel firms report a steady demand and a heavy volume of business. With contracts awarded totalling $424,089,200, Canadian construction for the current year to October 31, indicates that there has been one-fifth more work started in Canada this year than in the same period of 1927.

It has been estimated that there is between $15,000,000 and $20,000,000 worth of structural steel work open for tenders in the Dominion at the present time. This estimate is based chiefly on the proposed erection of large buildings in eastern Canada and the construction of new bridges in both sections of the country. The bridge companies have never looked upon such a fruitful field of prospective business at any former period.

The National Steel Car Corporation, of Hamilton, has just received an order from the Dominion Power and Transmission Co. for twelve double-truck street cars, to cost $250,000. The company also reports an order from the Canadian Pacific Railway for 15 passenger car frames and 250 refrigerator cars. The Canada Foundry and Forgings, Ltd., have been booking some big orders lately including axles for the heavy locomotives being built by the Canadian Locomotive Co., and large pieces used in steamship construction. Recently, it was announced that the forge plant was running on a double shift turning out forgings for the Ford Motor Co. This business has been supplemented by contracts obtained from the Chrysler Motor Company.

A substantial increase in electric power demand during recent months has necessitated the expenditure of large sums of money for generating and distributing equipment, as well as increased purchases of motive machinery and electrical supplies for the utilization of the power generated. Recently the Canadian Westinghouse Co., Ltd., received an order from the Calgary Power Co. for three large generating units to be installed at the company's new plant on the Ghost River in the province of Alberta.

Production of automobiles is about double the number produced at the same period last year.

NEW YORK

Conditions in the machine tool market in the Metropolitan district were somewhat spotty in the past week in that there was disagreement as to the volume of business obtained. At least two dealers reported a noticeable slowing up in orders, while others indicated that the month had gotten off to an excellent start as far as the volume of orders went. One of the features of the week's buying was the purchase of six planers by R. Hoe & Co., which had been anticipated for some time. Gray and Cincinnati planers were favored. Three or more other large orders also were placed during the week, each involving ten or more machines. This is the first time that any large orders have been placed in some months, the feature of this market being a large volume of single-unit purchases during the period.

Considerable optimism is expressed on all sides as to future business in view of the nature and volume of inquiries. The Hoe concern is expected to become an important factor in the next few months in view of the removal of the plant to the Bronx. Lathes are indicated as being next in order of purchase. The Wright Aeronautical Corporation is also expected to reenter the market on a large scale in the near future.

Used equipment continues to be sold in quantity, and the market is now the best in some time.

Sales reported by the Triplex Machine Tool Co. include a good volume of small tools, four Ames bench lathes, a metal-cutting bandsaw, and a Campbell nibbler.

The Pratt & Whitney Co. sold during the week: a No. 12 profiler, five 13x30-in. lathes, five 16x36-in. lathes, one 20x72-in. lathe, a bench lathe, a jig borer, four die sinkers, a bench hand miller, a Sigourney bench drill and a 14-in. vertical surface grinder. The Niles Tool Works Co. sold a Bement extra-heavy, 42-in. double rotary planer. The Niles Crane Corporation sold a 5-ton, 34-ft. span crane, a 12-ton, 34-ft. crane, and a 25-ton, 43-ft. crane.

CINCINNATI

Without exception, the machine tool manufacturers of the Cincinnati district report that business has held up well during the past week. Those who expected a lull to take place because of the election were agreeably disappointed, and now that it is over it is expected that the sales curve will resume its upward trend. All manufacturers interviewed stated that the first ten months of this year have shown a gain over the corresponding period of the previous year, and the forecast is that business will be at a good level through the next two months.

Selling agents report that with them the demand has been at about the same level as in the previous week. There has been some tendency to hold back orders, it is stated, due to the political situation, but now that the election is over it is expected that the present sales resistance will diminish to an appreciable extent.

The sustaining feature of the week's market was the sale of single tools to miscellaneous users, located in all sections of the country, whose requirements were well diversified as to sizes and types. However, considerable business came from automobile and truck manufacturer and makers of parts and accessories.

A good volume of inquiries were received in the week, some of which indicate that several industries are about to begin buying in a larger way. Among the inquiries reported were several from South America and a small number from European countries.

Several manufacturers of machine tools have added to their working forces from time to time, until skilled labor is becoming rather scarce.

INDIANAPOLIS

Increasing business is the feature of the local machinery and machine tool market. Now that the election is over, there appears to be every reason for optimism, even though the fact that this was election year cut but little figure in the volume. There appears to be a stability in most of the basic industries using machines and machine tools in this area that is gratifying to the trade.

The automobile industry, while not buying in record quantities, continues in good production and the demands made on the machinery trade are steady. Perhaps, of course, the most favorable sign just at present is the increasing business with the coal trade. Indiana's mines and those of Southern Illinois, always good customers of the local machine tool trade, are getting back into production rapidly. Not only machine tools, but a large quantity of special coal mining machinery is being purchased. Most of the Indiana mines had been out of production nearly a year and a half and many replacements had to be made before coal again could be mined.

A good demand for special machinery used in the manufacture of radio equipment also is seen. During the last six months this demand has grown rapidly and the state now is increasing in importance in the manufacture of this commodity, particularly cabinets. The automobile body trade is in good shape, as judged by the special machinery being purchased. Punches, drills, stamping machines among

the metal machines and a wide assortment of woodworking machines are being purchased.

The farm implement trade is not buying heavily, but their production is increasing and will become a factor in the business before the end of the year. Used machinery dealers say there is a fair business, with electrical trades predominating in the demand.

CHICAGO

An appreciable, though slight, letup in machine tool buying has been noted during the last week. The volume of business transacted as a whole, however, compares favorably with that of the weeks immediately preceding, and, from all reports, is likely to continue good throughout 1928. Inquiries are increasing in number since the result of the national election was made known, a result that apparently has been in accordance with the desires of probably ninety per cent of the machinery trade. The business now coming in is from widely scattered sources, and comprises tools of every class.

With the exception of the Chicago, Milwaukee, St. Paul and Pacific R.R., which has closed on some items contained in a list of recent issue, railroad buying is limited to immediate requirements. Automotive and kindred industries continue as active factors in the market. Reports to the effect that the International Harvester Co. shortly will issue a list comprising a variety of equipment for its Fort Wayne (Ind.) shops are current. In some lines of machine tools deliveries by manufacturers are far behind, automatic screw machines being among the number. Demand for grinding machines continues active, a large proportion of the output being absorbed by the automotive and auto-accessory industries.

Dealers in used tools report continued good trade, the demand principally being for screw machines, millers, planers, shapers and presses.

Founders Association Meeting

The National Founders Association, 29 S. La Salle St., Chicago, will hold its annual meeting in New York at the Hotel Astor on November 21 and 22. James A. Emery, counsel of the association, will speak on industry and the federal courts. L. A. Hartley, director of industrial education for the association, will tell "What Foremen Think About." Virgil Jordan, chief economist of the National Industrial Conference Board, will present the paper: "Business Prosperity and the Basic Industries," while Charles F. Abbott, executive director of the American Institute of Steel Construction, Inc., will present: "The New Forces in Business." The regular convention dinner will be held on November 21 at which Dr. John L. Davis will make an address, "The Dimensions of Life."

Conference on Welding

Purdue University announces its fourth annual conference on welding to be held at Lafayette, Indiana, on December 12-14, under the direction of the Engineering Extension Department, and the Department of Practical Mechanics, with the School of Chemical Engineering and manufacturers of welding equipment co-operating. This educational conference will be devoted to the applications of electric, oxyacetylene and thermit welding to manufacturing and repair operations.

Plans Are Progressing for General Machinery Association

The matter of the formation of a general trade association in the machinery industries assumed definite form at a conference held in Washington, November 7, in which representatives of equipment and machinery associations, officials of the U. S. Chamber of Commerce, and Commerce Department specialists participated. A resolution was passed authorizing a further meeting in Washington sometime next February. Before the next meeting is held, members of the conference will be asked to suggest additional questions that they would like taken up.

A tentative set of agreements for discussion at a trade practice conference with agents of the Federal Trade Commission, was presented by representatives of the Association of Manufacturers of Woodworking Machinery as a suggestion to the other trades. The Woodworking Machinery group expects to have its trade practice conference, under the plan laid down by the Federal Trade Commission, in the first part of December.

Baker's Address

Some of the basic principles favored by general practice in the establishment of trade associations, were reviewed by Hugh P. Baker, manager of the Trade Association Department of the National Chamber of Commerce. Mr. Baker pointed out that the first and most obvious requisite in the formation of a trade association is the selling of the association idea to the rest of the trade. While admitting that there is some belief that trade associations should concern themselves only with general practices and methods, he recommended a more direct policy. The association, to be of real service, should take up the actual problems of its individual members and help them put their businesses on a higher plane, he said. He gave warning also that there is danger of an association becoming over-organized, especially if it allows itself to be diverted too much from its immediate problems.

The necessity for the machinery industry to impress its economic importance on the public through an educational program, was stressed by W. H. Rastall, chief of the Industrial Machinery Division of the Commerce Department. Mr. Rastall pointed to the Good Roads Movement as an example of what can be done through public relations work to help an industry in attaining its potential proportions. The people should be made to realize that the United States is able to export annually two billion dollars worth of goods, maintaining high wages the while, largely through the production scale made possible by machinery, he said.

Characterizing the machinery industry as "sick" despite its prosperity, Mr. Rastall called attention to the fact that according to the last available income tax returns, 51.8 per cent of the machine tool manufacturers operated without profit. If Congress and the public were informed of the importance of the industry, he contended, help might be extended in lean years by inducing the Navy Yards to speed up the modernization of their 45 million dollars worth of equipment.

The procedure followed by the Federal Trade Commission in conducting a trade practice conference, was explained by H. P. Fowler, of the research department of the U. S. Chamber of Commerce. Mr. Fowler stated that the Trade Commission divided the rules agreed to at such a conference into two groups: The first included such things that are in themselves unlawful whether or not a trade conference might agree upon them; the second consists of practices that would not come under the Commission's scope unless the trade conference had agreed upon them. In answer to questions, he stated that the Commission only had jurisdiction over violators of group-two rules that had agreed to the practices adopted at the conference.

Aeronautical Notes

The National City Co., banking firm of New York City, has acquired a substantial interest in the Boeing Airplane and Transport Corporation, a new company which will control through stock ownership the Boeing Airplane Co. and the Boeing Air Transport Co. The investment is said to be between $5,000,000 and $10,000,000. Establishment of a trans-continental airplane passenger route using tri-motor twelve-passenger Boeing planes has been under consideration by the Boeing company for some time and the consolidation of interests is now regarded as presaging announcement of fruition of the plans. The funds will be used for extension of the Boeing plant at Seattle and for improvement of present flying equipment and facilities.

Plans are being made by the Laurel Motors Corporation, of Anderson, Ind., to manufacture airplane motors in a plant there at Walton and 24th Sts., formerly a rubber manufacturing plant, according to V. L. Wright, who holds an option on the property. D. J. Des Champs of New York City and Brussels, aviation engineer, has been in conference with Mr. Wright on the new motor which is to be of a radial air-cooled type. Mr. DesChamps is the designer of Minerva motors and other engines.

Business Items

Clemson Bros., Inc., Middletown, N. Y., announces its forty-fifth anniversary in a greeting card.

The Lamson & Sessions Co., Cleveland, is planning to erect a large bolt and nut plant in North Birmingham, Ala., on a plot of 8½ acres.

The **Foote Bros. Gear & Machine Co.**, Chicago, has purchased a factory property on West 13th St., that city, which the company will remodel for its occupancy.

The **Boye & Emmes Machine Tool Co.**, Cincinnati, announces that it has appointed Knickerbocker, Cram & Co., Inc., 7 E. 42nd St., New York, as agent for the company's lathes in the New York territory.

The **Continental Can Co., Inc.**, has acquired the can-making business of the Hardesty Manufacturing Co., of Denver, Colo. Continental Can recently has acquired the Passaic Metal Ware Co., the United States Can Co., the Seattle-Astoria Iron Works, the Southern Can Co. and the New Orleans Can Company.

The **Lyons Machinery & Stamping Works**, Clinton, Iowa, the firm name of the company operated by Elroy A. Sison, has filed voluntary petition in bankruptcy with liabilities of $10,555 and assets of $61,355. Included in the latter, however, are machinery and tools scheduled at $40,000 and stock in trade, $10,000.

The **Liberty Machinery Sales Co.**, Hamilton, Ohio, has been incorporated with a capital of 1,000 shares of no-par stock for the purpose of dealing in all kinds of machinery and especially metal-working equipment. The incorporators are A. R. McCann, P. Beninghofer, F. B. Yingling and B. R. Millikin.

Letters of incorporation have been granted to the **Spencer Manufacturing Co.**, Dwight, Ill., to manufacture and deal in farm implements, structural steel work, foundry and machine work, etc. Capital, $100,000, and 6,000 shares common non-par value. Incorporators: W. P. Johnson, P. A. Gibbons and Edward Johnson.

The **United State Sandpaper Co.**, Williamsport, Pa., has purchased the Federal Abrasive Works, Inc., of Westfield, Mass., and the Standard Abrasive Co., of Garfield, N. J. These two plants will be consolidated under the name of the Standard Abrasive Co. with offices and factory at Garfield. The general offices of the consolidation will be in Williamsport.

The **Commonwealth Steel Co.**, Granite City, Ill., has recently completed a locomotive bed shop, 600 ft. long by 175 ft. wide. The machinery installed includes large milling machines, planers, cylinder-boring machines, and horizontal and radial drills. The equipment is of sufficient capacity to machine locomotive beds for the largest locomotives built.

Directors of the **Metropolitan Vickers Electrical Co., London**, announce that an agreement has been reached whereby the International General Electric Co., New York, will acquire a stock control of the British Thomson Houston Co. and of the Edison Swan Electrical Co., Ltd., and almost the entire capital of Ferguson Pallin, Ltd., on lines involving a purchase price of about £2,000,000.

Marshalltown (Iowa) business men have formed a syndicate and have subscribed $50,000 to a new foundry enterprise to replace the Central Foundry, which was destroyed by fire last winter. W. B. Wood and James M. Glenn, officers of the old Central, head the new concern which expects to be in operation by Jan. 1 with a force of 30 or 40 molders. The building will be 110x125 ft., with cupola and two-story office structure. The company will be incorporated with $100,000 capital.

The **Graybar Management Corporation** was recently formed to take over the ownership of the Graybar Electric Co., from the Western Electric Co. All of the capital stock of the management corporation will be owned by the officers and employees of the Graybar Electric Co., but the preferred, non-voting stock will be held by the Western Electric Co. The management concern has an initial capitalization of $3,000,000, with $6,000,000 of preferred stock. The management of the Graybar concern will remain as at present.

Announcement of a merger of the National Equipment Co., of which the Koehring Co., Milwaukee, is the parent company, the Parsons Co. of Newton, Iowa, manufacturers of power trench excavators, and the Insley Co., Indianapolis, machinery, in a $9,000,000 corporation was made by Phil A. Koehring, president and treasurer of the central corporation. The acquisition of the Parsons and Insley companies by the National Equipment Company is reported to have involved more than $3,500,000 and was accomplished through the exchange of stock.

Announcement has been made from Philadelphia that A. Atwater Kent, manufacturer of radio sets, has broken ground for a new $3,000,000 factory which will double the size and capacity of the present, 16½-acre plant, making it the largest radio factory in the world and one of the largest industries in the United States. The policy of handling all manufacturing activities on one floor, under mass-production, belt-assembly principles, will be followed in the new plant, which will be situated across the street from the present plant in Germantown, Philadelphia. The factory is expected to be completed by the first of May.

Quantity production of the de Havilland "Gypsy Moth" airplane will begin at once in the Moth Aircraft Co.'s new plant at Lowell, Mass., which has over 100,000 sq.ft. of floor space. Frank M. Smith is general factory manager and second vice-president. He was formerly superintendent of construction for the Navy. J. E. Morrow, formerly vice-president in charge of production of the Willis-Morrow Co., of Elmira, N. Y., is production manager. The company will be assisted by engineers of the de Haviland Aircraft Co., of England. Minton M. Warren is president of the Moth concern, and Earl L. House, vice-president.

Construction activities incident to a five-year expansion program launched by the Frank Foundries Corporation, Moline, Ill., are under way and will represent an immediate expenditure of more than $100,000 and include two new buildings upon the Dimock, Gould & Co. site, adjoining the present Frank plant, which was recently acquired. The new buildings, of concrete and steel construction, will be 100x70 and 160x100 ft., and the project includes remodeling one of the three-story plants on the site into a work shop and storage unit. The foundry turns out a wide variety of metal castings, but at the present time is concentrating upon automotive industry castings.

The Sommer interests, identified with the Keystone Steel & Wire Co. have purchased the Acme Factory Sites in South Bartonville, near Peoria, Ill., the tract embracing 16 acres with 300,000 sq.ft. under roof. Although the purchase has been emphasized as one by the Sommer interests rather than the Keystone factory, it is believed the buildings will ultimately be utilized by the Keystone. The Ganschow Gear Works has a long time lease on the old Acme blacksmith shop, 80x300 ft. and the Black Wire Rope Co. on the old boiler house, neither occupancy which is to be disturbed by the change in ownership. The main building, three stories, nearly 250 ft. square, will probably be used as a warehouse and five other buildings are being repaired and fitted for occupancy. The property was acquired four years ago by a local syndicate from the defunct Acme Harvesting Machine Company.

Personals

FRED S. ERB, of the Erb-Joyce Foundry Co., Detroit, has been named general chairman of the membership committee of the Gray Iron Institute.

FRANK J. WACHTER, who has been connected with the sales department of the Landers, Frary & Clark Co., has been made sales manager of the Union Manufacturing Co., New Britain, Conn., maker of chucks and hoists.

J. F. ROGERS, 726 Oliver Bldg., Pittsburgh, Pa., has been appointed representative of the Pennsylvania Pump and Compressor Co., of Easton, Pa. GUSTAVO PRESTON, 113 Broad St., Boston, Mass., has also been named representative.

R. M. SANDBERG has been appointed general manager of the Columbia Tool Steel Co., Chicago Heights, Ill. He has been associated with the company for the past sixteen years, and is an active member of the American Society for Steel Treating.

JOHN E. OLSEN, for many years with the Chicago sales organization of the Niles-Bement-Pond Co., has joined the sales force of the E. C. Cummings Co., 545 W. Lake St., Chicago, representing a number of manufacturers of machine tools.

DR. W. H. HATFIELD, director of the Brown Firth Research Laboratories, Sheffield, England, addressed the New York Chapter of the American Society for Steel Treating on Nov. 12 on the subject of heat-, rust-, and acid-resisting steels.

E. C. PETER, for 23 years vice-president of the American Ironing Machine Co., Algonquin, Ill., has been made president. M. J. Broderick, assistant secretary and treasurer, has been elected vice-president and general manager. B. C. Getzelman is now secretary, and W. T. Peter, treasurer.

J. S. MOCK, sales manager of Jenkins Bros. Ltd., Montreal, manufacturers of valves, has been appointed a director of the firm. Mr. Mock joined Jenkins Bros. in 1915 as a member of the sales staff and was placed in charge of the Toronto office. He returned to the Montreal office in 1921 as sales manager of the company, his present position.

JOHN C. NEWMAN, of Montreal, has been appointed a director of Baldwins, Ltd., London, England. Mr. Newman is a well-known figure in the industrial field in Canada. He first became prominent as manager of the Montreal division of the McClary Manufacturing Co., and in October, 1927, was named executive head of General Steel Wares, Ltd. He is also a director of Canadian Vickers, Ltd., president of the Thomas Davidson Manufacturing Co., Ltd., and president of Baldwins Montreal, Limited.

Obituaries

M. H. FESLER, sales manager of the Automatic Machine Co., Bridgeport, Conn., died on Nov. 8 from an attack of appendicitis at Cleveland, Ohio, while on a business trip.

P. D. WHITAKER, president of the Whitaker Pump Co., Denver, Colo., died October 28, aged 52. He was a native of Enfield, North Carolina, and a graduate of the state university.

GEORGE H. MILLEN, president of the E. B. Eddy Co., of Hull, Que., and an outstanding figure in the newsprint machinery industry of Canada, died at his residence in Hull on Nov. 3. The late Mr. Millen was identified with the Eddy company for 60 years. He was born at Glen Falls, N. Y., in 1838, and was one of the few surviving veterans of the American Civil War. In addition to being an expert mechanic, Mr. Millen was an inventor of many machines now used in the Eddy match factory and in similar plants all over the world. He also perfected intricate parts of other machines and made improvements in the machinery used in his own plant that in time were copied and became standard in various parts of Canada and the United States.

Forthcoming Meetings

Society of Automotive Engineers. Production meeting, Book-Cadillac Hotel, Detroit, Mich., Nov. 22-23. Coker F. Clarkson, secretary, 29 W. 39th St., New York City.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York, week of Dec. 3. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

Seventh National Exposition of Power and Mechanical Engineering. Held at Grand Central Palace, New York, N. Y., week of December 3.

Power Transmission Association. Annual meeting, Hotel Commodore, New York City, Dec. 6. Association headquarters, 644 Drexel Bldg., Philadelphia.

Western Metal Congress and Western States Metal & Machinery Exposition. Held in Los Angeles, Jan. 14-18, under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

The Weekly Price Guide

Rise and Fall of the Market

THE 41,578,411 tons of steel ingots produced in the U. S. during the first ten months of 1928, represent a gain of 12 per cent, compared with the output of 37,095,244 tons in the corresponding period last year. Mills have also worked nearer capacity this year, having averaged 84.83 per cent, against 77.83 per cent in the first ten months of 1927. Steel demand continues heavy in shapes, plates, railway material, wire products, sheets, and pipe. Automotive material, on the other hand, is moving slower, while scrap continues weak. The pig-iron market shows strength with yard stocks limited and demand for coke heavy. C.-I. pipe prices tend upward owing to higher costs of iron and scrap, the movement in this case being obviously unseasonal.

(*All prices as of Nov. 9, 1928*)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	25.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	16.25
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	22.26
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4 50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.35	3.25	3.90*
No. 12	2.05@2.15	3.40	3.30	3.95*
No. 14	2.15@2.25	3.45	3.35	4.00*
No. 16	2.25@2.35	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.55@2.65	3.60	3.30	4.00
No. 22	2.70@2.80	3.75	3.45	4.15
No. 24	2.75@2.85	3.80	3.50	4.20
No. 26	2.85@2.95	3.90	3.60	4.30
No. 28	3.00@3.10	4.05	3.75	4.45
Galvanized				
No. 10	2.70@2.80	3.95	3.65	4.25
Nos. 12 to 14	2.80@2.90	4.05	3.75	4.35
No. 16	2.90@3.00	4.15	3.85	4.45
No. 18	3.05@3.15	4.30	4.00	4.60
No. 20	3.20@3.30	4.45	4.20	4.75
No. 22	3.25@3.35	4.50	4.25	4.80
No. 24	3.50@3.60	4.65	4.35	4.95
No. 26	3.65@3.75	4.90	4.60	5.20
No. 28	3.90@ .00	5.15	4.85	5.45

250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—½	⅝	¾	⅞	1	1¼	1½
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; $\frac{1}{8}$, 7.85c.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			16 50
Tin, Straits, pigs, New York			51 50
Lead, pigs, E. St. Louis	6.32½	New York	8.00
Zinc, slabs, E. St. Louis	6.25	New York	7.75

	New York	Cleveland	Chicago
Antimony, slabs	13.25	14.75	14.25
Copper sheets, base	24.62½	25.00	24.25
Copper wire, base	21.25	21.25	17 50*
Copper bars, base	23.12½	23.50	23.25
Copper tubing, base	26.00	26.37½	25.75
Brass sheets, high, base	20.25	20.50	20.00
Brass tubing, high, base	25.12½	25.37½	24.87½
Brass rods, high, base	18.00	18.25	17.75
Brass wire, high, base	20.75	21.00	20.50

*At mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%+	25.00*	24.30	24.30
Zinc sheets (casks)	10.00@10.50	11.00	10.01
Solder (½ and ½)	34.25	33.00	31@34
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade			66.75
Commercial genuine, intermediate grade			53.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			12.25
Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:			
Ingots 35.00	Electrolytic 37.00	Shot	36.00

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled nickel rods, Grade "A" (base)	45.00
Cold drawn nickel rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	28.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper	14.12½@14.37½	13.75	12.75@13.25
Copper, heavy, and wire	13.50 @14.12½	13.00	12.12½@12.50
Copper, light, and bottoms	11.75 @12.25	11.00	11.00@11.50
Heavy lead	5.25 @ 5.37½	6.25	4.75@ 5.25
Tea lead	3.50 @ 4.00	4.25	3.75@ 4.25
Brass, heavy, yellow	8.00 @ 8.25	8.50	8.00@ 8.50
Brass, heavy, red	10.75 @11.25	....	10.25@10.75
Brass, light	6.50 @ 7.00	6.75	6.75@ 7.25
No. 1 yellow rod turnings	9.00 @ 9.50	9.50	8.75@ 9.25
Zinc	3.25 @ 3.50	3.25	3.00@ 3.50

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb	.16@16¼	38.00 per M	.17
Sal soda, per lb	.02	.02	.02
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb	.109	.11	.108
Cutting oil, about 25% lard, in 5 gal. cans, per gal	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30–5%	30–5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	50%	50–10%	50%
Second grade	60%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb	$0.0325	$0.0325	$0.0324
Cold drawn shafting	per lb	.034	.034	.04
Brass rods	per lb	.18	.175	.16
Solder (½ and ½)	per lb	.3425	.3475	.3575
Cotton waste, white	per lb	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No 1, 6-in. dia	per 100	3.59	3.05	3.10
Lard cutting oil	per gal	.65	.65	.65
Machine oil	per gal	.30	.30	.27
Belting, leather, medium	off list	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper	$4.05	$4.29	$4.29
Emery cloth	20.22	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper	2.04	2.04	2.04
Cloth	3.59	3.59	3.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville, 2.85@3.00		
Coke, prompt foundry, per net ton	Connellsville, 4.00@4.50		
White lead, dry or in oil	100 lb. kegs	New York, 13.25	
Red lead, dry	100 lb. kegs	New York, 13.25	
Red lead, in oil	100 lb. kegs	New York, 14.75	

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1⅛ and 1¼ in. dia.	35%
Carriage bolts:	
Up to ¾ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ¾ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including $\frac{7}{16}$-in. dia.	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

D. C., Washington—Post Office Dept.—will receive bids until Nov. 19 for twelve portable electric drills.

Ind., Anderson—Wright Aeroplane Motor Co., Walton and 24th Sts.—machinery and equipment for the manufacture of Belgian aeroplane motors for plant.

Kan., Kansas City—Universal Car Loading & Distributing Co., 1504 Wyoming St.—traveling crane for proposed 1 story, 75 x 250 ft. depot. Estimated cost $100,000.

Mass., Cambridge (Boston P.O.)—Blanchard Machine Co., 64 State St.—traveling crane.

Mich., Northville—Stinson Aircraft Corp.—general equipment for proposed 1 story, 180 x 300 ft. airplane factory. Estimated $150,000.

N. J., Newark—Bd. of Education, R. O. Beebe, Dir.—will receive bids until Nov. 16 for machinery and equipment for auto mechanics and sheet metal departments, etc. for Essex County Vocational School.

O., Cleveland—Wheeling & Lake Erie Ry. Co., W. W. Griswold, Purch. Agt.—80 in. wheel press and horizontal punching press.

O., Columbus—Stanton Motors Inc., 841 North High St., A. T. Stanton, Pres.—additional shop equipment for new service station on East Broad St.

O., Columbus—Steam Motor Co., 2608½ North High St., H. C. Dunning, Gen. Mgr.—complete equipment including several lathes, two grinders, one drilling machine, one boring machine, etc. for proposed shop.

Pa., East Pittsburgh—Westinghouse Electric & Mfg. Co., Walnut and 30th St., Philadelphia—one 5 ton overhead electric crane.

Pa., Etna—Enameled Products Co.—one 5 ton overhead electric crane, 57 ft. span.

Pa., Pittsburgh—McClintic Marshall Co., Oliver Bldg.—one 5 ton overhead electric crane, 44 ft. span.

Ont., Ford City—H. V. Wells, 24 Wyandotte St. E.—complete equipment for the manufacture of automobile accessories for proposed 1 story, 100 x 100 ft. factory. Estimated cost $50,000.

Ont., Lunnville — Lundy Steel Products Ltd. (wire fence and gates)—additional looms and equipment to cost $30,000.

Opportunities for Future Business

Calif., Los Angeles—Continental Can Co., 303 San Fernando Rd., is having plans prepared for the construction of a 2 story, 300 x 600 ft. factory. Francisco & Jacobus, Pershing Sq. Bldg., Archts.

Calif., Oakland—Boiler Tank & Pipe Co., 4061 Hollis St., Piedmont, is having plans prepared for the construction of a 1 story boiler shop on Russett St. here. Estimated cost $60,000. Private plans.

Calif., San Francisco — T. Veyhle, 1326 22nd Ave., will build a 2 story planing mill at Tavaral St. and Cortez Ave. Estimated cost $10,000.

Conn., Bristol—New Departure Mfg. Co., is having plans prepared for addition to machine shop 26, on Franklin St. Lockwood, Greene & Co., 24 Federal St., Boston, Engrs.

Conn., Bridgeport—American Tube & Stamping Co., 766 Stratford Ave., awarded contract for the construction of a 3 story, 35 x 100 ft. factory. Estimated cost $50,000.

Conn., New Britain—Landers, Frary & Clark, Center and Commercial Sts., awarded contract for a 1 story, 30 x 123 ft. enameling plant. Estimated cost $110,000.

Ill., Chicago—Hurley Machine Co., West 22nd St. and South 54th Ave., awarded contract for the construction of a 2 story, 80 x 400 ft. addition to plant for the manufacture of electric washing machines, electric ironers, etc. at West 22nd St. and South 44th Ave.

Ind., Evansville—Graham Bros., Stringtown Rd., will soon award contract for the construction of an automobile factory. Estimated cost $250,000. Thole & Legeman, 307 America Trust Bldg. Archts.

Ind., Indianapolis—J. D. Adams, 217 South Belmont St., manufacturers of road machinery, awarded contract for a 1 story, 108 x 175 ft. factory. Estimated cost $450,000.

Ind., Fort Wayne—John Deere Co., Moline, Ill., is receiving bids for the construction of a 4 story, 100 x 100 ft. factory at Jackson and West Main Sts. here. Estimated cost $150,000.

Ind., Indianapolis—Argonaut Realty Co, General Motors Bldg., Detroit, Mich., awarded contract for a 2 story, 120 x 267 ft. automobile building at West Pratt St. and Big Four Ry. here. Estimated cost $200,000.

Ind., Indianapolis—Sylvester Johnson, 3668 Central Ave., awarded contract for a 1 story, 65 x 135 ft. machine shop and garage at 3757 North Illinois St. Estimated cost $45,000. Noted Nov. 1.

Md., Baltimore—Western Electric Co., E. S. Bloom, Pres., 195 Broadway, New York, N. Y., subsidiary of American Telephone & Telegraph Co., plans the construction of a plant for the manufacture of telephone cable and wire here. Estimated cost approximately $15,000,000.

Mass., Lynn—Gallant Motor Co., 319 Essex St., is receiving bids for a 1 story, 45 x 105 ft. repair and service garage. Estimated cost $50,000. G. A. Cornet, 10 Central Ave., Archt.

Mass., Springfield—Moore Drop Forging Co., A. H. Chapin, Pres., awarded contract for a 2 story addition to plant on Walter St.

Mass., Waltham (Boston P. O.) — J. Totten & Sons, 74 Bacon St., will build a 1 story, 50 x 200 ft. repair and service garage on Winter St. Estimated cost $50,000. Noted Feb. 16.

Mich., Detroit—Packard Motor Car Co., 1580 East Grand Blvd., awarded contract for a 2 story, 130 x 383 ft. car storage building. Estimated cost $150,000. Noted Nov. 8.

Mich., Saginaw—Wilcox Products Div. of Wilcox-Rich Corp., Rust St., manufacturers of automobile parts, awarded contract for a 1 story, 30 x 271 ft. factory. Estimated cost $50,000.

Mo., St. Louis—Metalcraft Corp., E. W. Spreen, Secy., 4515 Clayton Ave., awarded contract for a 1 story, 180 x 253 ft. metal working factory at 5101 Penrose Ave. Estimated cost $60,000.

N. H., Hanover — Bd. of Selectmen, awarded contract for a 2 story, 50 x 90 ft. repair and service garage. Estimated cost $50,000.

N. J., North Bergen—F. J. Mullery Iron Works Inc., 574 12th St. West New York, will build a 2 story, 200 x 200 ft. factory on 28th St. here. Estimated cost $75,000. C. Eicholz, 960 Bergenline Ave., Union City, Archt.

N. J., Paterson—Wright Aero Corp., 238 Lewis St., awarded contract for a 1 and 2 story addition to airplane factory at 238 Lewis St. Estimated cost $65,000.

N. J., Trenton—Trudel-Harper Motor Co., awarded contract for the construction of a garage and service station at 830 and 832 Brunswick Ave. Estimated cost $39,000.

N. Y., Brooklyn—Steel & Tubes Inc., J. L. Sussman, Pres., Scott Ave. and Montrose Ext., awarded contract for the construction of a factory. Estimated cost $40,000. Noted Oct. 25.

N. Y., New York—Bator Realty Corp., H. E. C'Donnel, Pres., 140 Nassau St., plans the construction of a 2 story, 120 x 126 ft. garage at Webster Ave. and Mosholu Parkway. Estimated cost $60,000. W. Shary, 41 Union Sq., Archt.

N. Y., New York—Kent Garage Investing Corp., 350 Madison Ave., is having plans prepared for the construction of a 25 story, 100 x 140 ft. automatic, mechanical and operating garage at Columbus Ave. and 61st St. Estimated cost $1,400,000.

N. Y., New York—Koenig Leiser Realty Corp., 391 East 149th St., will build a 2 story, 93 x 100 ft. garage at Mayflower and Wilkinson Sts. Estimated cost $98,000. Cohn & Siegel, 45 West 57th St., Archts. Noted Oct. 25.

N. Y., New York—A. Rappold, Rockville Center, plans a 2 story, 68 x 125 ft. garage at Westchester Ave. an Olmstead Ave. Estimated cost $40,000. W. Shary, 41 Union Sq., Archt.

N. Y., St. George (br. Staten Island)—F. Cooley, 107 Central Ave., plans the construction of a 75 x 100 ft. garage at Montgomery Ave. and Fort Pl. Estimated cost $150,000.

N. Y., St. George (br. Staten Island)—St. George Gardens, Inc., 26 Court St., Brooklyn, plans the construction of a garage at Henry and Cleveland Sts., here. Estimated cost $40,000. S. Gardstein, 44 Court St., Brooklyn, Archt.

O., Canton — Hercules Motor Co., 140 Halliwell Pl. S. E., awarded contract for the construction of a 1 story, 90 x 180 ft. factory. Estimated cost $100,000.

O., Cleveland—State Dept. of Public Welfare, c/o J. E. Harper Dir., Columbus, will receive bids until Nov. 22 for the construction of a 1 story, 125 x 125 ft. industrial building here. Estimated cost $110,000. H. B. Briggs, Hartman Hotel Bldg., Columbus, Archt.

Pa., Philadelphia—A. Atwater Kent Mfg. Co., 4700 Wissahickon Ave., manufacturers of radios, awarded contract for a 1 story, 515 x 911 ft. addition to factory. Estimated cost $1,000,000. Noted Nov. 8.

Pa., Pittsburgh—Pittsburgh Foundry & Machine Co., plans the construction of a foundry. A. M. Tapp, Jenkins Arcade, Archt.

R. I., Providence—Brown & Sharpe Mfg. Co., H. Sharpe, Pres., awarded contract for addition to foundry on Promenade St. Estimated cost $40,000.

R. I., Providence—Colt, Birmingham & Brady Inc., 1 Reservoir Ave., is receiving bids for a 1 story, 70 x 150 ft. repair and service garage on Reservoir Ave. Estimated cost $50,000. W. G. Richards, 72 Weybosset St., Archt.

R. I., Providence—Dept. of Public Buildings, will soon award contract for a 1 and 2 story repair shop, and drill tower. Estimated cost $65,000. T. J. H. Pierce, City Hall, Engr.

R. I., Providence—Uncas Mfg. Co., 85 Sprague St., awarded contract for the construction of a 2 story jewelry factory on Sprague St.

Wash., Seattle—Boeing Airplane Co., 330 West Front St., plans additions to plant including hangars, repair shops, etc. Estimated cost $4,000,000.

W. Va., Parkersburg—Parkersburg Rig & Reel Co., J. Crawford, Pres., 1440 Market St., plans addition to plant. Private plans.

Wis., Milwaukee—Seaman Body Corp., 1732 Richards St., awarded contract for a 5 story, 100 x 300 ft. factory at Richards St. and Capitol Dr. Estimated cost $250,000.

Ont., Toronto—Hyslap Bros., 12 Shuter St., awarded contract for a 5 story, 87 x 157 ft. garage at Bay and St. Albans Sts. Estimated cost $200,000.

Ont., Toronto — Willys - Overland Ltd., Weston Rd., awarded contract for the construction of a 1 story, 90 x 270 ft. addition to automobile plant. Estimated cost $150,000. Noted Sept. 13.